

Checklist of the apoid wasps (Hymenoptera, Apoidea excluding Anthophila) of Canada, Alaska and Greenland

Matthias Buck¹, Andrew M. R. Bennett²

1 Royal Alberta Museum, 9810-103a Avenue NW, Edmonton, Alberta, T5J 0G2, Canada **2** Agriculture and Agri-Food Canada, Canadian National Collection of Insects, Arachnids and Nematodes, K.W. Neatby Bldg., 960 Carling Avenue, Ottawa, Ontario, K1A 0C6, Canada

Corresponding author: Matthias Buck (buckmb@gmail.com)

Academic editor: Michael Ohl | Received 6 December 2024 | Accepted 9 January 2025 | Published 13 February 2025

<https://zoobank.org/C399908C-5530-4D5D-810C-E6E0B9F56435>

Citation: Buck M, Bennett AMR (2025) Checklist of the apoid wasps (Hymenoptera, Apoidea excluding Anthophila) of Canada, Alaska and Greenland. Journal of Hymenoptera Research 98: 195–291. <https://doi.org/10.3897/jhr.98.143759>

Abstract

The present checklist is the product of a critical taxonomic review of the Canadian/Alaskan fauna during the previous two decades. As of December 2024, 531 described species in 84 genera of apoid wasps (Ammoplanidae, Ampulicidae, Astatidae, Bembicidae, Crabronidae, Mellinidae, Pemphredonidae, Philanthidae, Psenidae, Sphecidae) are recorded from Canada and Alaska. Seventy species and two genera (*Psammaletes* Pate and *Larra* Fabricius) are newly recorded from the area, including eight accidentally introduced species and three naturally Holarctic species. Compared to the previous Catalog of Hymenoptera in America north of Mexico (Krombein 1979) the number of recorded species in Canada and Alaska has increased by 124% and the number of genera by 42%. The genera *Foxia* Ashmead and *Pluto* Pate are also recorded for the first time, but they are not included in the checklist because their species remain either unidentified or undescribed. A total of 23 species are non-native and have been introduced accidentally from other biogeographic regions. *Crabro dietrichi* R. Bohart is newly recognized as the only species endemic to the area of the checklist (restricted to Prince Edward Island, Canada). A total of 2109 provincial, territorial and Alaskan records are included, 705 of which (33.4%) are new. Records are based on verified material from 22 different collections, only 1.6% rely exclusively on data in the literature. The Alaskan fauna consists of 63 species (31 new records) in 24 genera (eight new records) and seven families, all of which are also known from Canada. No apoid wasps have been found in Greenland. The regions with the most diverse faunas are Alberta (326 species, 64 genera), Ontario (294 spp., 71 genera), British Columbia (292 spp., 64 genera) and Saskatchewan (248 spp., 58 genera). The highest number of new records are from Alberta (124 spp.), Saskatchewan (117 spp.), Manitoba (113 spp.) and New Brunswick (60 spp.). The greatest numbers of species exclusive to one political area within Canada and Alaska are recorded from British Columbia (63 spp.) and Ontario (44 spp.). In order to clarify species concepts, type

material or images of types of 57 nominal species were examined. This led to 25 taxonomic changes. Eight synonyms are reinstated as valid species: *Gorytes decorus* Fox, **sp. restit.**, *Nysson freyigessneri* Handlirsch, **sp. restit.**, *Lindenius errans* (Fox), **sp. restit.**, *Oxybelus pacificus* (Rohwer), **sp. restit.**, *Diodontus antennatus* (Mickel), **sp. restit.** (extralimital to the area of the checklist), *D. nigritus* Fox, **sp. restit.** and *Pemphredon bipartior* Fox, **sp. restit.** *Diodontus beulahensis* (Rohwer), **sp. restit.** (extralimital to the area of the checklist) is a suspected synonym of *D. americanus* Packard. Fourteen new or revised synonymies are proposed: *Crabro canningsi* Finnamore, **syn. nov.** = *C. maeklini* Morawitz, *Crossocerus eriogoni* (Rohwer), **syn. nov.** = *C. minimus* (Packard), *Solierella foxii* (Viereck, 1906; nec 1902) (preoccupied), **syn. rev.** = *S. mammillata* Buck, **nom. nov.**; *Diodontus gillettei* Fox, **syn. nov.**, *D. rugosus* Fox, **syn. nov.**, *D. florissantensis* Rohwer, **syn. rev.**, *D. bidentatus* Rohwer, **syn. nov.**, *D. siouxensis* (Mickel), **syn. nov.**, and *D. striatus* (Mickel), **syn. nov.** are all = *D. americanus*; *D. vallicolae* Rohwer, **syn. nov.**, *D. vallicolae salicis* Rohwer, **syn. rev.**, *D. maestus* (Mickel), **syn. rev.** and *D. ater* (Mickel), **syn. rev.** are all = *D. nigritus* Fox; *Mimesa gregaria* (Fox), **syn. nov.** = *M. uncinata* Cresson. Two new replacement names are proposed for preoccupied names: *Solierella mammillata* Buck, **nom. nov.** (for *Niteliopsis foxii* Viereck, 1906) and *Mimesa curta* Pulawski & Buck, **nom. nov.** (for *Psen simplex* Malloch, 1933). In an appendix, taxonomic changes and revised species concepts of 33 species or species complexes are briefly explained in order to clarify their status and avoid confusion. The biogeography of Canadian and Alaskan species is discussed, including Holarctic species and species shared with other biogeographic regions, distribution patterns within the Nearctic region, endemism, remarkable new records, geographic prevalence of nesting habits, distribution patterns and introduction timelines of introduced species, as well as faunal change. *Diodontus minutus* (Fabricius) is newly recognized as an introduced species from the Palearctic region despite first being discovered in North America in 1934. Based on literature data and observations on the internet platform iNaturalist.org, we document recent, rapid range expansions in ten native species of Sphecidae, Philanthidae and Bembicidae. These trends are likely caused by climate change and are projected to further increase apoid wasp diversity in Canada in the future. Lastly, we discuss the important contribution citizen science is making to faunistic wasp research through iNaturalist and other collaborative websites.

Keywords

Ammoplanidae, Ampulicidae, Astatidae, Bembicidae, biogeography, citizen science, Crabronidae, endemism, faunal and climate change, introduced species, Mellinidae, Nearctic region, new records, new synonyms, Pemphredonidae, Philanthidae, Psenidae, species distribution, Sphecidae, taxonomy

Introduction

This checklist details the apoid wasps (Hymenoptera: Apoidea, excluding Anthophila) of Canada, Alaska and Greenland and is the fourth checklist in the series (see Bennett 2021; Goulet and Bennett 2021; Huber et al. 2021; Bennett et al. 2024). Apoid wasps include some of the most charismatic and attractive species of Hymenoptera that have fascinated both researchers and naturalists alike. Not surprisingly, they are also among the most thoroughly studied groups of wasps in our fauna (Bohart and Menke 1976). Worldwide, they include 10,210 described species (Pulawski 2025), roughly 7% of all described Hymenoptera, which are estimated to comprise around 154,000 species (Huber 2017). The vast majority of apoid wasps are idiobiont ectoparasitoids of other insects and spiders (often incorrectly referred to as “predators” in older literature, e.g., Bohart and Menke 1976).

Depending on the taxon, adult female wasps provide various levels of brood care to their offspring. In the study area, the host spectrum includes nine insect orders: Orthoptera, Blattodea, Thysanoptera, Hemiptera, Psocodea, Coleoptera, Hymenoptera, Lepidoptera, and Diptera (e.g., Bohart and Menke 1976; Evans 1966; Evans and O'Neill 2007; Krombein 1967). Hosts are usually either immature stages or adults but may include both, depending on the species (Evans 1966; Krombein 1967). Females sting the host after capture in order to paralyze it. In most species the paralysis is permanent (Andrietti 2011). Members of the genus *Microbembex* Patton (Fig. 16) are the only apoid wasps that provision their nests with dead arthropods (Evans 1966). Most species excavate ground nests or use pre-existing cavities above ground (e.g., old burrows in dead wood) to protect their offspring and food provisions from predators, parasitoids and adverse environmental conditions. The nesting habits of some species are intermediate between the two categories, e.g., when pre-existing ground burrows are used as nest sites (e.g., in *Solierella* Spinola, see Williams 1950). Nesting habits are usually conserved within each genus, except in a few cases in which they diverge between subgenera (e.g., in *Crossocerus* Lepeletier & Brullé, see Pate 1944). Ground-nesting species can be recognized by unique morphological adaptations in females that facilitate digging and nest construction such as rake setae on the fore tarsus and a flattened pygidial plate on the last tergum (Bohart and Menke 1976). Only a few species in the study area construct free-standing mud nests (e.g., Coville 1982; Sheldon 1968; Shafer 1949; Figs 88–89). Nest construction as well as other aspects of brood care fall exclusively on the female, except for a few species in which males may guard the nest (Krombein 1967; Coville 1982). Depending on the species, nests are comprised of one or more cells, with plasticity in some species (e.g., Evans 1966; Kurczewski 2010). Each cell is provisioned with multiple hosts, except for Ampulicidae and *Larra* Fabricius in which the larva develops on a single host (e.g., Krombein 1967; Menke 1992). Most species practice mass provisioning, which means that all hosts are stored in the nest before the larva emerges. A few, highly evolved species provision progressively, i.e., hosts are brought in as the larva develops (e.g., Evans 1965, 1966). Nyssoninae and *Stizoides* Guérin-Méneville (Fig. 31) are kleptoparasites in the nests of other apoid wasps (Evans 1966). The complex biology of apoid wasps has been the subject of many behavioural and evolutionary studies (e.g., Evans 1962; Alcock et al. 1978; Kurczewski 2010; Andrietti 2011; Coelho 2011). Extensive taxonomic-systematic research during the 20th century has furthermore created a solid taxonomic framework for the Nearctic fauna (summarized by Bohart and Menke 1976; Pulawski 2025), though recent genetic studies have led to changes in the higher classification (e.g., Sann et al. 2018, 2020). More recently, apoid wasps have attracted attention from ecologists and conservation researchers due to the preferences of some species for sensitive and endangered habitat types such as dune systems, native prairie, etc. (e.g., Acorn 2011; Kurczewski 2000; Onuferko et al. 2023; Heneberg et al. 2013). Last but not least, the recent publication of excellent natural history books on Hymenoptera and aculeate wasps (e.g., Marshall 2023; Holm 2021) has made the group much more accessible to naturalists and the general public. Citizen science platforms such as iNaturalist.org and BugGuide.net, have furthermore contributed to an exponential growth of interest in apoid wasps and other aculeates. Despite being the

focus of such broad attention, faunistic knowledge of Canadian and Alaskan apoid wasps has developed slowly and is still fragmentary for many regions.

Previous to this checklist, the most comprehensive source of distributional data on Canadian and Alaskan apoid wasps has been the Catalog of Hymenoptera in America north of Mexico (Krombein 1979) and its predecessor (Krombein 1951). In these works, distributions are often presented as ranges, without explicitly mentioning provinces and territories. This, and the numerous new records that have been discovered since have prompted the need for a more detailed and up-to-date resource for Canada and Alaska. Foundational from a taxonomic perspective is Bohart and Menke's (1976) *Sphecoid Wasps of the World – a Generic Revision*, which provides keys to the families and genera, catalogs all the species, diagnoses genera, tribes, subfamilies and families, discusses their systematics and summarizes the biological knowledge and range information available at the time. Pulawski (2025) provides an up-to-date synonymic catalog and classification of World species with type information and extensive literature references for each species, a complete bibliography, including a table with numbers of valid species for every genus worldwide. This monumental and exceptionally detailed work contributed extensively to the present checklist.

Regional checklists are currently only available for half of the Canadian provinces and territories. The oldest one is the list for Alberta (Strickland 1947), followed by Finnamore (1982, 1997) for southern Quebec and the Yukon, respectively, Buck (2004) for Ontario, and Ratzlaff (2016) for British Columbia. Similarly, the database of the University of Alaska Museum through Arctos (UAM 2024) has served as an Alaskan checklist for about a decade (e.g., see Sikes and Allen 2016). Other important sources of faunistic data are Steiner (1973) for the Northwest Territories and Yukon, Blades and Maier (1996) for the southern Okanagan region of British Columbia, Finnamore (1994) for central Alberta, Finnamore and Buckle (1999) for the Canadian Forces Base Suffield in Alberta, and Onuferko et al. (2023) for dune areas in the Canadian Prairie provinces. Pioneering faunistic-taxonomic studies that are now outdated and merely of historical interest include Provancher's *Faune Canadienne* (1877–1882, 1883a) and *Petite faune entomologique du Canada* (1883b, 1885–1889), Harrington (1902) for the Ottawa area of Ontario, Carter (1925) for Alberta, and Spencer and Wellington (1948) for British Columbia (Sphecidae only).

Methods

Sources of data

The present checklist is the result of a critical review of the apoid wasp fauna of Canada and Alaska that started in 2001 and involved examination of thousands of specimens from various collections. The majority of records are based on material in the Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario (CNC), the Royal Alberta Museum, Edmonton, Alberta (PMAE), and the Univer-

sity of Guelph, Ontario (**DEBU**). In addition, we examined specimens from the following collections (listed alphabetically): Lincoln Best collection (private), Corvallis, Oregon (**BEST**), Centre for Biodiversity Genomics, Guelph, Ontario (**BIOUG**), Bohart Museum of Entomology, University of California, Davis, California (**BMEC**), Canadian Museum of Nature, Gatineau, Quebec (**CMNC**), Gerald Hilchie Collection (private), Edmonton, Alberta (**GJHC**), Insectarium de Montréal, Montréal, Quebec (**IMQC**), Lyman Entomological Museum, McGill University, Montréal, Quebec (**LEMQ**), Manitoba Museum, Winnipeg, Manitoba (**MMMN**), New Brunswick Museum, Saint John, New Brunswick (**NBMB**), Natural History Museum, London, U.K. (**NHMUK**), Northern Forestry Centre, Edmonton, Alberta (**NOFC**), Laurence Packer Collection, York University, Toronto, Ontario (**PCYU**), Royal BC Museum, Victoria, British Columbia (**RBCM**), Royal Ontario Museum, Toronto, Ontario (**ROM**), Royal Saskatchewan Museum, Regina, Saskatchewan (**RSKM**), Spencer Entomological Collection, University of British Columbia, Vancouver, British Columbia (**SMDV**), College of Environmental Science and Forestry, State University of New York, Syracuse, New York (**SUNY**), University of Alaska Museum of the North, Fairbanks, Alaska (**UAM**), Strickland Entomological Museum, University of Alberta, Edmonton, Alberta (**UASM**), J. B. Wallis / R. E. Roughley Museum of Entomology, University of Manitoba, Winnipeg, Manitoba (**WRME**).

Type material was examined from the following collections (see also start of Appendix 1):

Academy of Natural Sciences, Philadelphia, Pennsylvania (**ANSP**), Canadian National Collection of Insects, Ottawa, Ontario (**CNC**), Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (**MCZC**), Snow Entomological Museum, University of Kansas, Lawrence, Kansas (**SEMC**), Collection Entomologique de l'Université Laval, Laval, Quebec (**ULQC**), Museum of Zoology, University of Michigan, Ann Arbor, Michigan (**UMMZ**), University of Nebraska, Lincoln, Nebraska (**UNSM**) and United States National Museum, Washington, DC (**USNM**).

We also included new records from the citizen science platforms iNaturalist (www.inaturalist.org) (acronym: iNat) and BugGuide (bugguide.net) (acronym: BugG) if we were able to verify identifications based on the provided images. Furthermore, we included some COI sequence-based records from the Barcode of Life Data System (www.boldsystems.org) (acronym: BOLD). These records were considered valid if they satisfied one of the following criteria: 1) Species identifications could be corroborated independently based on examination of voucher specimens or images of voucher specimens provided on their website, or 2) when sequences either matched those of expert-identified specimens or those of specimens in the first category. We consider this sufficient proof since preliminary data have shown that apoid wasps are generally well identifiable by their DNA barcodes (Schmid-Egger et al. 2018). Unverified literature records make up a very small portion (1.6%) of the records in this checklist. We consider these records credible even though we have not personally seen any specimens from the same jurisdictions. Doubtful literature records were not included but are mentioned in the notes under each genus (or subgenus) in Table 2. Erroneous records are dealt with in the same way. In some cases, erroneous deleted records were added back as new records

supported by more recent data. Erroneous records from the 19th century are not listed unless they were included in Krombein (1979) or in regional checklists. For species with described subspecies, we mention the subspecies that occur in the area of the checklist in the notes under genera or subgenera in Table 2. The two records for the French islands of St. Pierre and Miquelon near the southern coast of Newfoundland are based on the TAXREF database (Gargominy et al. 2021) and iNaturalist. No apoid wasps have been documented from Greenland. With respect to the recorded species numbers (Table 1), we only include described species in the totals, not undescribed taxa or specimens identified only to genus, although we do note two newly recorded genera for Canada for which no described or identified species are currently known (see Results and discussion – Overview of the fauna, below). Fossils are not included in the checklist. All records published up to the end of 2024 were evaluated for the current checklist.

Presentation of data

The main results of our study are presented in two tables: Table 1 reports the number of described species and genera per family by region, and Table 2 shows the occurrence of each species by region. Table 3 deals with undescribed and Tables 5, 6 with introduced species. The acronyms used for the regions in these tables are: **CAN** = Canada, **AK** = Alaska (USA), **YT** = Yukon Territory, **NT** = Northwest Territories, **NU** = Nunavut, **BC** = British Columbia, **AB** = Alberta, **SK** = Saskatchewan, **MB** = Manitoba, **ON** = Ontario, **QC** = Quebec, **NB** = New Brunswick, **PE** = Prince Edward Island, **NS** = Nova Scotia, **LB** = Labrador, **NF** = Newfoundland island, **GL** = Greenland (Denmark). For convenience of use, the taxonomic arrangement in Table 2 is strictly alphabetical at every taxonomic level, rather than phylogenetic. Records are classified either as 1) new, 2) published and substantiated by collection records or photographic records, or 3) published but unverified. The different types of records are indicated in different fonts and colours in Table 2 (see Table heading). We did not consider records as published if they were merely implied as part of a larger range (e.g., “transcontinental in Canada”), or if they were only reported on the internet. Unless otherwise mentioned, all records are substantiated by specimens in the Canadian National Collection. Unfortunately, it was not feasible to include additional depositories in Table 2. For species without voucher specimens at the CNC we mention only one other depository in the table, even if there were multiple others. Due to the limitations of space, we did not include literature references for individual published records, except if they could not be verified by examination of specimens or images. Nevertheless, all publications that contributed distribution records are included in the References section. Table 2 also provides references to revisions, keys or other important taxonomic literature under the respective genus, tribe, subfamily or family headers. In addition to the published checklist, the data presented in Table 2 will be available online through Canadensys (<https://data.canadensys.net/ipr/resource?r=aafc-hymenoptera-canada-ak-gl>) and will also be registered on GBIF (Bennett 2024).

Higher classification

One of the key questions of Apoidea systematics has been the position of the bees within the phylogenetic system (e.g., Melo 1999, and subsequent studies cited below). Due to the paraphyly of apoid wasps with regard to bees, the systematic placement of the latter within the Apoidea determines how apoid wasp must be classified into families. The close relationship between bees and apoid wasps has long been postulated (e.g., see Müller 1872; Ashmead 1896). However, finding the sister group of the bees has been an iterative process that is still ongoing and remains a matter of scientific debate. Bohart and Menke's (1976) foundational revision included all apoid wasps in a paraphyletic family Sphecidae, despite acknowledging a close relationship of the bees with some of its constituent subfamilies. The North American catalog (Krombein 1979) elevated the subfamilies to family level but still kept them in their own superfamily Sphecoidea, separate from the bees. However, with the advance of phylogenetic systematics, this arrangement could no longer be upheld. Lomholdt (1982) and Melo (1999) proposed new classifications where Sphecidae (s.s.) and Ampulicidae were given family status and the remainder of the former subfamilies were united in the Crabronidae as the putative sister group of the bees. Subsequent molecular studies (e.g., Debevec et al. 2012; Branstetter et al. 2017; Peters et al. 2017) proposed different phylogenies for the Apoidea but agreed on the fact that the bees are nested even deeper within the Crabronidae (s.l.). Therefore, Sann et al. (2018) proposed to reinstate most of Krombein's (1979) families. Furthermore, Sann et al. (2018, 2021) proposed that the Pemphredoninae (or Pemphredonidae) of earlier authors are paraphyletic as well, postulating the former tribe Ammoplanini as the sister group of the bees. This resulted in the elevation of most of the former Pemphredoninae tribes to family level, namely Ammoplanidae, Pemphredonidae and Psenidae. These findings are still very recent and require critical testing both from a morphological and genetic perspective. We tentatively adopt Sann et al.'s (2021) classification for the present checklist, but we acknowledge that it is but a snapshot in a rapidly evolving field of study. As with every other classification of Apoidea that has been published up to the present it will become outdated, probably sooner rather than later. Based on Sann et al. (2021), we recognize ten apoid wasp families for the Nearctic region including the area of this checklist. In phylogenetic order they are: Ampulicidae, Sphecidae, Crabronidae, Mellinidae, Astatidae, Bembicidae, Psenidae, Philanthidae, Pemphredonidae and Ammoplanidae.

Taxonomy

Below the family level, our classification largely follows Pulawski (2025), with ranks of subfamilies, tribes and subtribes adjusted to the current family classification (see above). Major taxonomic treatments for each group are cited under their respective headers in Table 2. It is worth noting that Pulawski (2025) corrected the actual publication dates of several taxa that were cited incorrectly in Krombein (1979). New insights gained during this study have led to a number of taxonomic changes at the

species level (new synonymies, species re-instated from synonymy, revised species concepts). All these are explained in Appendix 1 and referred to by superscript notes in Table 2. Most of the changes occur in a few problematic genera for which the taxonomy is poorly known, namely *Diodontus* Curtis, *Solierella*, *Gorytes* Latreille and *Nysson* Latreille. In order to clarify the status of problematic species, we examined type material or images of type specimens of 57 nominal species (see Appendix 1). The new findings will be the subject of a series of taxonomic reviews and subsequent papers, which will include detailed species diagnoses and new identification keys.

Biogeography

For the biogeographic analysis, species were classified into four groups according to their east-west distribution: transcontinental, eastern, western and central. The classification is based on the overall distribution in America north of Mexico, not restricted to Canada and Alaska. Transcontinental species are defined as species that reach at least one coastal province or state on each side of the continent. For practical reasons, we adopt similar criteria to define eastern and western species in order to avoid arbitrary range demarcations in the middle of the continent, regardless of divergent definitions of these terms elsewhere in the literature. For the purposes of our biogeographic analysis, eastern species have ranges that attain one or more coastal provinces (see Fig. 1) or states on the Atlantic side of the continent. Conversely, western species attain one or more coastal provinces or states on the Pacific side. Central species do not attain coastal provinces or states on either side of the continent. Some introduced species with anthropogenically caused disjunct distributions cannot be classified according to this scheme and were omitted from the analysis. Species are furthermore classified into northern, if the main part of their New World range lies within Canada and Alaska, or southern, if it falls south of the Canadian border. This is not always easy to determine and therefore our statistics can only provide an approximate picture.

Native species are here defined as those that occur naturally in the Nearctic region, whereas introduced species have arrived in the region accidentally by anthropogenic means. The introduced species we list here are all considered established, even though some of them have only been recorded a few times, probably due to their small size and inconspicuous nature. A single exception is noted in Table 2 and in the discussion, referring to a species that appears to have been established for a certain period of time but lacks recent records. In most cases, introduced species are easily recognized as such because they are common and well-known in their native range and have suddenly appeared in North America. A few cases, however, are less straightforward, e.g. when introductions have happened a long time ago or when they involve poorly known taxa. Some species have only tentatively been considered introduced until recently, and one species that has been known from North America for almost a century is newly recognized as introduced in the present paper (see Results and discussion: Introduced species). In doubtful cases, the criteria used to distinguish introduced from native species are largely based on biogeographic considerations. Naturally occurring Holarctic species

almost always have ranges that include Beringia whereas introduced species show patterns that cannot be explained readily by a dispersal through Beringia. The vast majority of introduced species at least initially show an asymmetrical west Palearctic/east Nearctic distribution pattern, even though many of them later spread farther into the continent or spawn disjunct western populations caused by subsequent anthropogenic dispersal across the continent. Unlike naturally occurring Holarctic species, all introduced apoid wasp species are absent from sparsely populated northern regions of the Nearctic, including Beringia (one exception). The very few introduced Oriental/east Palearctic species show highly unusual ranges that cannot be explained by natural dispersal. Introduced species are usually first detected in densely populated areas near major ports since their dispersal depends on transcontinental travel and shipping routes (e.g., Kurczewski 1998). The correlation between nesting habits and introductions is discussed in the Results and discussion section. Introduced species are considered invasive when their occurrence causes harmful environmental, economic, and/or social impacts (e.g., see Beggs et al. 2011).

Nesting habits

Information on nesting habits was extracted from Bohart and Menke (1976), Krombein (1979) and Pulawski (2025). In apoid wasps, nesting habits are usually conserved within a given group, whether it be family, subfamily, genus or subgenus. Species whose nesting habits have not been observed were categorized based on morphological characteristics shared with congeners whose nesting habits are known. Ground-nesting species possess rake setae on the female fore tarsus, enabling them to dig nests, and the pygidial plate of female metasomal tergum 6 is flat, used to tamp soil. These morphological features are not developed in cavity nesters. Within the area of the checklist, only a few genera include both ground- and cavity-nesting species, such as *Ectemnius* Dahlbom, *Crossocerus* and *Mimumesa* Malloch. Most species can readily be classified into nesting habit categories, except for the majority of Ammoplanidae and some *Solierella*. The nesting habits of Ammoplanidae are poorly known in general (Bohart and Menke 1976). *Solierella* has both ground- and cavity-nesting species (Krombein 1979). The categories become somewhat blurred in this genus as some species use pre-existing cavities in the soil (Williams 1950), and some species show intermediate morphological conditions (i.e., variably developed rake setae in species of the *S. fossor*-group). These species could not be categorized.

Results and discussion

Overview of the fauna

The area of the checklist (Fig. 1) is home to 531 described species, 70 of which represent new records, both for the area of the checklist and for Canada (Tables 1, 2). The confirmed species are distributed across ten families:

Table 1. Number of described, recorded species (upper half) and genera (lower half) of apoid wasps (Apoidea excluding Anthophila) of Canada, Alaska and Greenland by family and region. See Methods for explanation of acronyms and Fig. 1 for a map of their locations. Other explanations: Total New Records: total of new provincial/territorial/Alaskan records (column 1) or new provincial/territorial records (column 2); Total records: total of provincial/territorial/Alaskan records (column 1) or provincial/territorial records (column 2).

| NUMBER OF SPECIES | CAN + AK+GL | CAN (new) | CAN % new | AK | YT | NT | NU | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF | GL |
|-------------------|-------------|-----------|-----------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|
| Ammoplanidae | 8 | 8(3) | 37.5 | 0 | 0 | 0 | 0 | 4 | 4 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ampulicidae | 2 | 2(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Astatidae | 22 | 22(4) | 18.2 | 3 | 6 | 6 | 1 | 18 | 18 | 12 | 5 | 6 | 5 | 2 | 1 | 2 | 0 | 0 | 0 |
| Bembicidae | 88 | 88(9) | 10.2 | 6 | 7 | 7 | 0 | 46 | 52 | 37 | 34 | 41 | 27 | 15 | 7 | 13 | 0 | 1 | 0 |
| Crabronidae | 199 | 199(29) | 14.2 | 30 | 35 | 32 | 2 | 102 | 122 | 91 | 79 | 121 | 82 | 45 | 24 | 36 | 10 | 24 | 0 |
| Mellinidae | 2 | 2(0) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pemphredonidae | 54 | 54(10) | 18.5 | 13 | 15 | 14 | 0 | 41 | 35 | 18 | 15 | 34 | 29 | 17 | 6 | 13 | 2 | 11 | 0 |
| Philanthidae | 58 | 58(4) | 6.9 | 1 | 2 | 3 | 0 | 25 | 36 | 33 | 26 | 29 | 20 | 9 | 4 | 6 | 0 | 0 | 0 |
| Psenidae | 38 | 38(8) | 21.1 | 7 | 7 | 10 | 0 | 17 | 19 | 20 | 12 | 28 | 20 | 12 | 4 | 10 | 6 | 5 | 0 |
| Sphecidae | 60 | 60(3) | 5.0 | 3 | 4 | 4 | 0 | 39 | 39 | 34 | 23 | 30 | 21 | 18 | 9 | 12 | 2 | 1 | 0 |
| TOTAL SPECIES | 531 | 531(70) | 13.0 | 63 | 76 | 76 | 3 | 292 | 326 | 248 | 195 | 294 | 209 | 118 | 55 | 92 | 20 | 42 | 0 |
| TOTAL NEW RECORDS | 705 | 674 | 69 | 31 | 13 | 25 | 3 | 45 | 124 | 117 | 113 | 20 | 40 | 60 | 35 | 44 | 8 | 27 | 0 |
| % NEW RECORDS | 34 | 33 | | 49 | 17 | 33 | 100 | 15 | 38 | 47 | 58 | 7 | 19 | 51 | 64 | 48 | 40 | 64 | 0 |
| TOTAL RECORDS | 2109 | 2046 | | | | | | | | | | | | | | | | | |
| NUMBER OF GENERA | | | CAN | AK | YT | NT | NU | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF | GL |
| Ammoplanidae | | | 5 | 0 | 0 | 0 | 0 | 3 | 4 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ampulicidae | | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Astatidae | | | 3 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 |
| Bembicidae | | | 24 | 4 | 4 | 4 | 0 | 19 | 18 | 16 | 14 | 19 | 12 | 9 | 7 | 8 | 0 | 1 | 0 |
| Crabronidae | | | 23 | 9 | 7 | 10 | 2 | 17 | 18 | 17 | 17 | 21 | 18 | 13 | 9 | 10 | 4 | 7 | 0 |
| Mellinidae | | | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pemphredonidae | | | 5 | 4 | 4 | 4 | 0 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 2 | 4 | 2 | 3 | 0 |
| Philanthidae | | | 5 | 1 | 2 | 2 | 0 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 0 | 0 | 0 |
| Psenidae | | | 5 | 2 | 2 | 2 | 0 | 3 | 2 | 2 | 2 | 5 | 5 | 3 | 2 | 4 | 2 | 2 | 0 |
| Sphecidae | | | 11 | 2 | 2 | 2 | 0 | 9 | 9 | 8 | 7 | 11 | 8 | 8 | 6 | 6 | 1 | 1 | 0 |
| TOTAL GENERA | | | 84 | 24 | 24 | 27 | 3 | 64 | 64 | 58 | 52 | 71 | 59 | 42 | 30 | 36 | 9 | 14 | 0 |

Ammoplanidae (Figs 2–6), Ampulicidae (Figs 7–8), Astatidae (Figs 9–11), Bembicidae (Figs 12–36), Crabronidae (Figs 37–59), Mellinidae (Fig. 60), Pemphredonidae (Figs 61–65), Philanthidae (Figs 66–70), Psenidae (Figs 71–76) and Sphecidae (Figs 77–87). This includes all known apoid wasp families except for the small and geographically restricted Heterogynaidae, Entomosericidae and Eremiaspheciidae, of which the latter two have only recently been raised to family level (Sann et al. 2021). Eighty-four genera are recorded based on described species (Tables 1, 2) and an additional two without included species (see below). This number is slightly less than one-third of the currently recognized worldwide total of apoid wasp genera (277 according to Pulawski 2025). *Psammaletes* Pate

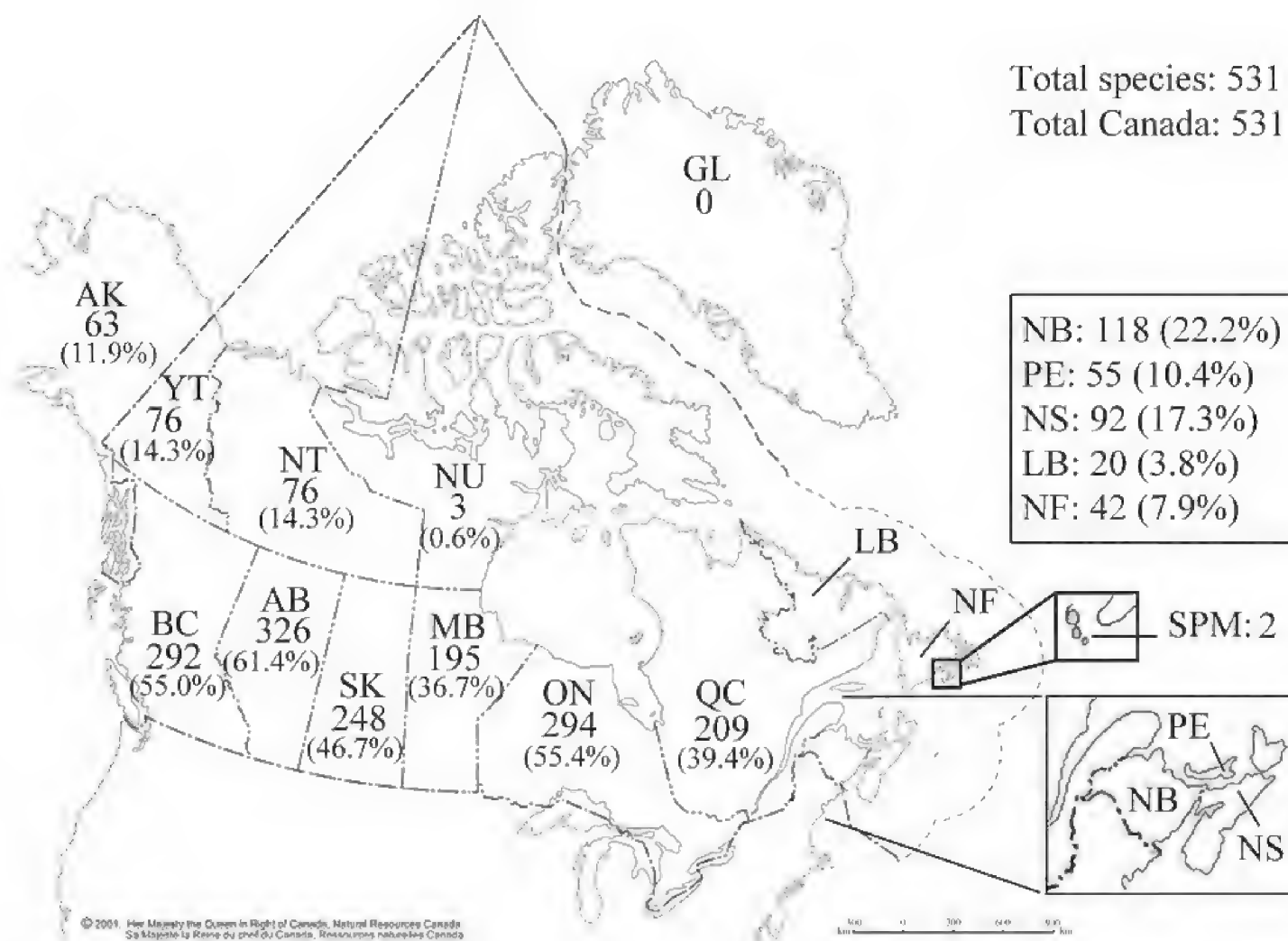


Figure 1. Map of Canada, Alaska and Greenland showing the number of described, recorded apoid wasp species and percentage of total species by region. Canada is comprised of all regions except for Alaska, Greenland and the islands of St. Pierre and Miquelon. See Methods section for acronyms of regions treated in the checklist (SPM: St. Pierre and Miquelon, France).

(Bembicidae) (Fig. 25) and *Larra* (Crabronidae) (Fig. 48) are newly recorded for the area of the checklist. *Pluto* Pate (Psenidae) (Fig. 73) is also newly recorded based on an undescribed species from Alberta and *Foxia* Ashmead (Bembicidae) (Fig. 33) with an unidentified species from British Columbia.

All species in this checklist are known from Canada, including the 63 Alaskan species. There are no apoid wasp records from Greenland. Outside the area of the checklist, two species of *Crabro* Fabricius, *C. latipes* F. Smith (iNaturalist 2022q) and *C. cribrellifer* (Packard) (Gargominy et al. 2021; unverified) have been recorded from the French Collectivity of St. Pierre and Miquelon. The 531 Canadian/Alaskan species make up 38.9% of the total number of species found in America north of Mexico (1365 spp. as of March 2024, see Pulawski 2025, including ten newly added Nearctic records from the present study). This constitutes a dramatic 124% increase compared to Krombein's (1979) Catalog, which listed merely 237 species from Canada (1139 from America north of Mexico). In relation to the World fauna, which currently includes 10,210 described species (Pulawski 2025), the Canadian fauna makes up 5.2% of all known species.

Table 2. Checklist of described species of apoid wasps (Apoidea excluding Anthophila) of Canada, Alaska and Greenland. See Methods for explanation of acronyms and Fig. 1 for their locations. The far right distributional column represents Greenland. Records in black, regular font have previously been published and were verified either through specimens or images of specimens. Red, boldfaced records are new (unpublished) and based on examined specimens, images of specimens or verified COI sequence data. Species denoted with the “\$” symbol have been introduced to the Nearctic from other biogeographic regions (see also Table 5). Examined voucher specimens are deposited in the CNC, unless noted otherwise in the far right column. Blue, italicized records are previously published but no specimens or images of specimens have been examined. Literature references are only given for “blue” records. For species with more than one reference or depository, the references/depositories are listed in order from left to right in accordance with the order of distributional columns. Notes are provided at the end of each genus or subgenus as required. Taxonomic references are provided below each genus- or family-group name. For family group taxa, keys to subfamilies, tribes, genera and subgenera are found in Bohart and Menke (1976), besides other sources that are mentioned explicitly.

| | | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|---|---|----|----|----|----|----|----|----|----|----|---|---|--|
| ORDER HYMENOPTERA | | | | | | | | | | | | | | | | | | | |
| SUPERFAMILY APOIDEA (excluding ANTHOPHILA) | | | | | | | | | | | | | | | | | | | |
| Generic revision and world checklist – Bohart and Menke 1976; world catalog and bibliography – Pulawski 2025; Nearctic catalog – Krombein 1979. Checklists: YT – Finnamore 1997; NT – Steiner 1973; BC – Ratzlaff 2016; AB – Strickland 1947; ON – Buck 2004; southern QC – Finnamore 1982. | | | | | | | | | | | | | | | | | | | |
| FAMILY AMMOPLANIDAE EVANS, 1959 | | | | | | | | | | | | | | | | | | | |
| Key to genera – Smith 2020. | | | | | | | | | | | | | | | | | | | |
| Genus <i>Ammoplanellus</i> Gussakovskij, 1931 | | | | | | | | | | | | | | | | | | | |
| North American review – Smith 2019. | | | | | | | | | | | | | | | | | | | |
| <i>A. umatilla</i> (Pate, 1945) | CAN | – | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| Genus <i>Ammoplanops</i> Gussakovskij, 1931 | | | | | | | | | | | | | | | | | | | |
| Nearctic revision – Bohart and Smith 1978. | | | | | | | | | | | | | | | | | | | |
| <i>A. moenkopi</i> Pate, 1939 | CAN | – | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | PMAE; RSKM |
| Genus <i>Ammoplanus</i> Giraud, 1869 | | | | | | | | | | | | | | | | | | | |
| North American review – Smith 2009. | | | | | | | | | | | | | | | | | | | |
| <i>A. unami</i> Pate, 1937 | CAN | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>A. varyumi</i> Pate, 1943 | CAN | – | – | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | Smith 2009 |
| Genus <i>Parammoplanus</i> Pate, 1939 ¹ | | | | | | | | | | | | | | | | | | | |
| Nearctic review – Smith 2010. | | | | | | | | | | | | | | | | | | | |
| <i>P. irwini</i> N. Smith, 2010 | CAN | – | – | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | RBCM; PMAE |
| <i>P. lenape</i> (Pate, 1937) ² | CAN | – | – | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | – |
| <i>P. verrucosus</i> N. Smith, 2010 | CAN | – | – | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | RBCM |
| ● ¹ Excluded species: <i>P. apache</i> (Pate, 1937), BC-Scudder 1994, misidentifications of <i>P. irwini</i> and <i>P. verrucosus</i> . ● ² BC-Scudder 1994: misidentifications of <i>P. irwini</i> and <i>P. verrucosus</i> . | | | | | | | | | | | | | | | | | | | |
| Genus <i>Pulverro</i> Pate, 1937 | | | | | | | | | | | | | | | | | | | |
| Key to species – Smith 1983. | | | | | | | | | | | | | | | | | | | |
| <i>P. columbianus</i> (Kohl, 1890) | CAN | – | – | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | SK-RSKM |
| FAMILY AMPULICIDAE SHUCKARD, 1840 | | | | | | | | | | | | | | | | | | | |
| SUBFAMILY AMPULICINAE SHUCKARD, 1840 | | | | | | | | | | | | | | | | | | | |
| Genus <i>Ampulex</i> Jurine, 1807 | | | | | | | | | | | | | | | | | | | |
| <i>A. canaliculata</i> Say, 1823 | CAN | – | – | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | – |
| SUBFAMILY DOLICHURINAE DAHLBOM, 1842 | | | | | | | | | | | | | | | | | | | |
| Genus <i>Dolichurus</i> Latreille, 1809 | | | | | | | | | | | | | | | | | | | |
| <i>D. greenei</i> Rohwer, 1916 | CAN | – | – | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | – |
| FAMILY ASTATIDAE LEPELETIER, 1845 | | | | | | | | | | | | | | | | | | | |
| Genus <i>Astata</i> Latreille, 1796 | | | | | | | | | | | | | | | | | | | |
| Revision of species in America north of Mexico – Parker 1962. | | | | | | | | | | | | | | | | | | | |
| <i>A. bakeri</i> F. Parker, 1962 ¹ | CAN | – | – | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – |
| <i>A. bechteli</i> F. Parker, 1962 ² | CAN | – | – | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | BC,SK-RSKM; AB-PMAE |
| <i>A. bicolor</i> Say, 1823 ³ | CAN | – | – | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | AB-PMAE; Finnamore 1982 |
| <i>A. leuthstromi</i> Ashmead, 1897 | CAN | AK | YT | NT | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | Parker 1962; YT-SMDV; MB-WRME; NB-LEMQ |

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|---|----|---|---|---|--|
| <i>A. mexicana</i> Cresson, 1881 | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | - |
| <i>A. nevadica</i> Cresson, 1881 ⁴ | CAN | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | - | - | SK-RSKM |
| <i>A. nubecula</i> Cresson, 1865 | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | - | - | - | - | - | - | AK-SMDV; NT-RBCM; ON-DEBU |
| <i>A. occidentalis</i> Cresson, 1881 | CAN | - | - | - | - | BC | AB | SK | - | ON | - | - | - | - | - | - | - | AB-PMAE; SK-GJHC; ON-DEBU |
| <i>A. unicolor</i> Say, 1824 ⁵ | CAN | - | - | - | - | BC | AB | - | - | ON | QC | NB | - | NS | - | - | - | AB-PMAE; QC-LEMQ; NB-iNat 2022a; NS-RSKM |
| <i>A. williamsi</i> F. Parker, 1962 | CAN | - | - | - | - | - | AB | - | - | - | - | - | - | - | - | - | - | PMAE |

● ¹ ON-Parker 1962: misidentification of *A. bicolor* (CNC). ● ² AB-Finnamore and Buckle 1999: misidentification of *A. nubecula*. ● ³ BC-Ratzlaff 2016: misidentification of *A. bakeri*. ● ⁴ AB-Strickland 1947: misidentification of *A. bakeri*. ● ⁵ AB-Finnamore and Buckle 1999: misidentification of *A. nubecula*.

Genus *Diploplectron* Fox, 1893 ¹

North American revision – Parker 1972.

| | | | | | | | | | | | | | | | | | | |
|---|-----|---|----|----|---|----|----|----|----|----|---|---|---|---|---|---|---|----------------------|
| <i>D. brunneipes</i> (Cresson, 1881) ² | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | AB-PMAE |
| <i>D. californicum</i> F. Parker, 1972 | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | RBCM |
| <i>D. ferrugineum</i> Ashmead, 1899 ³ | CAN | - | - | - | - | - | AB | SK | - | - | - | - | - | - | - | - | - | NOFC; RSKM |
| <i>D. fossor</i> Rohwer, 1909 | CAN | - | YT | NT | - | BC | AB | SK | MB | - | - | - | - | - | - | - | - | Parker 1972; AB-PMAE |
| <i>D. peglowi</i> Krombein, 1939 ⁴ | CAN | - | YT | NT | - | BC | AB | SK | - | ON | - | - | - | - | - | - | - | YT;BC-SMDV |

● ¹ See Appendix 1: Taxonomy notes. ● ² BC-Ratzlaff 2016, AB-Strickland 1947 (as *D. bidentatum* Ashmead, 1899) and AB-Finnamore and Buckle 1999: misidentifications of *D. fossor*. ● ³ SK-Sheffield 2017. ● ⁴ BC-Blades and Maier 1996: misidentification of *D. brunneipes*. Note: this might be a complex of two species.

Genus *Dryudella* Spinola, 1843

North American revision – Parker 1969.

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|----|----|----|----|----|---|----|---|---|---|---|---|---|------------------|
| <i>D. caerulea</i> (Cresson, 1881) | CAN | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | - | - | SMDV; PMAE; RSKM |
| <i>D. elegans</i> (Cresson, 1881) | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | SMDV |
| <i>D. immigrans</i> (Williams, 1946) | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | SMDV |
| <i>D. montana</i> (Cresson, 1881) | CAN | - | YT | NT | - | BC | AB | SK | MB | - | - | - | - | - | - | - | - | NT-UASM |
| <i>D. picta</i> (Kohl, 1888) ¹ | CAN | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | - | - | AB-PMAE; SK-RSKM |
| <i>D. pinguis</i> (Dahlbom, 1832) | CAN | AK | YT | NT | NU | - | AB | - | MB | - | QC | - | - | - | - | - | - | AK-UAM; NU-DEBU |
| <i>D. rhimpa</i> F. Parker, 1969 ² | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | - |

● ¹ NT-Steiner 1973: misidentification of *D. montana*. ● ² YT-Finnamore 1997: misidentification of *D. montana*.

FAMILY BEMBICIDAE LATREILLE, 1802

SUBFAMILY ALYSSONTINAE DALLA TORRE, 1897

Genus *Alysson* Panzer, 1806

Synopsis of North American species – Fox 1894b.

| | | | | | | | | | | | | | | | | | | |
|--|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|----|---|----------------------------|
| <i>A. conicus</i> Provancher, 1889 | CAN | - | - | - | - | - | - | - | MB | ON | QC | NB | - | - | - | - | - | MB-WRME |
| <i>A. guignardi</i> Provancher, 1887 ¹ | CAN | - | - | - | - | - | - | - | MB | ON | QC | NB | PE | NS | - | - | - | MB-WRME; PE-PMAE; NS-BIOUG |
| <i>A. melleus</i> Say, 1837 | CAN | - | - | - | - | - | - | - | MB | ON | QC | - | - | - | - | - | - | MB-WRME |
| <i>A. oppositus</i> Say, 1837 | CAN | - | - | - | - | - | - | - | MB | ON | QC | NB | - | NS | - | - | - | NS-BIOUG |
| <i>A. radiatus</i> Fox, 1894 | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | - |
| <i>A. triangulifer</i> Provancher, 1887 ² | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | - | - | - | NF | - | NB-BugG 2019a; NF-NOFC |

● ¹ YT-Finnamore 1997 and BC-Ratzlaff 2016: misidentifications of *A. triangulifer*. ● ² *A. t. triangulifer* is eastern, *A. t. shawi* Bradley, 1920, AB to AK.

Genus *Didineis* Wesmael, 1852

Key to North American species – Malloch and Rohwer 1930.

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|----|----|----|----|---|---|---|---|---|---|------------------|
| <i>D. dilata</i> Malloch & Rohwer, 1930 | CAN | - | - | - | - | - | AB | SK | MB | ON | - | - | - | - | - | - | - | ON-DEBU |
| <i>D. latimana</i> Malloch & Rohwer, 1930 ¹ | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | - |
| <i>D. nodosa</i> Fox, 1894 | CAN | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | - | - | AB,SK-PMAE |
| <i>D. peculiaris</i> Fox, 1894 | CAN | - | - | - | - | - | AB | SK | - | - | - | - | - | - | - | - | - | AB-PMAE |
| <i>D. stevensi</i> Rohwer, 1923 | CAN | - | - | - | - | - | AB | SK | MB | - | - | - | - | - | - | - | - | AB-PMAE; SK-CMNC |
| <i>D. texana</i> (Cresson, 1873) ² | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | ON-DEBU |

● ¹ AB-Finnamore and Buckle 1999: misidentifications of *D. stevensi* and *D. dilata*. ● ² QC-Finnamore 1982: misidentification of *D. latimana* (see Buck 2004).

[illegible]

[illegible]Genus *Hoplisoides* Gribodo, 1884

Canadian review – Buck 2007; North American review - Bohart 1997.

[illegible]

● ¹ AK-Krombein 1979: likely in error (depository unknown). ● ² *H. n. nebulosus* NS to MB, *H. n. spilopterus* (Handlirsch, 1888) SK to BC.
● ³ *H. p. pergandei* (Handlirsch, 1888).

Genus *Lestiphorus* Lepeletier, 1832

North American review – Pate 1946.

| | | | | | | | | | | | | | | | | | | |
|-------------------------------------|-----|---|----|----|---|----|----|----|---|----|----|----|---|----|---|---|---|---|
| <i>L. cockerelli</i> (Rohwer, 1909) | CAN | – | – | NT | – | – | AB | – | – | ON | QC | NB | – | NS | – | – | – | NT-UASM; AB-PMAE; QC-LEMQ; NB-DEBU; NS-iNar 2023a |
| <i>L. piceus</i> (Handlirsch, 1888) | CAN | – | YT | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | YT-BOLD 2016a; AB.SK-PMAE |

Genus *Oryttus* Spinola, 1836 ¹

Synopsis of New World species – Bohart 1968.

[illegible]

● ¹ Excluded species: *O. laminiferus* (Fox, 1896), BC-Ratzlaff 2016, misidentification of *O. mirandus*. ● ² *O. g. gracilis* in ON, *O. g. arapaho* (Pate, 1938) in AB; ON: occurrence status uncertain, based on a single specimen from 1920 (Buck 2004).

Genus *Psammaletes* Pate, 1936

Key to species – Bohart 2000.

P. mexicanus (Cameron, 1890) CAN – – – – – ON – – – – – DEBU

Genus *Saygorytes* Nemkov, 2007

Key to species – Bohart 1969 (as *Pseudoplisus phaleratus*-group).

S. phaleratus (Say, 1837) CAN - - - - **AB SK MB** ON QC **NB PE NS** - - - AB-PMAE; SK,NS-RSKM; MB-WRME; NB-BugG 2014a; PE-iNat 2022c

TRIBE SPHECIINI NEMKOV & OHL, 2011

Genus *Sphecius* Dahlbom, 1843

Key to New World species – Holliday and Coelho 2006.

S. speciosus (Drury, 1773)¹ CAN - - - - - ON - - - - -

- ¹ BC-iNat 2023l, 2024d: likely adventive.

TRIBE STICTIELLINI R. BOHART & HORNING, 1971

Keys to genera and species – Bohart and Gillaspay 1985.

Genus *Glenostictia* Gillaspy, 1962[illegible]Genus *Steniolia* Say, 1837[illegible]

● ¹ *S. s. albicantia* J. Parker, 1917.

Genus *Stictiella* J. Parker, 1917¹

| | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|----|-----------|----|---|---|---|---|---|------------|
| <i>S. emarginata</i> (Cresson, 1865) | CAN | – | – | – | – | BC | AB | SK | MB | ON | – | – | – | – | – | – |
| <i>S. pulchella</i> (Cresson, 1865) ² | CAN | – | – | – | – | – | – | SK | MB | – | – | – | – | – | – | CMNC; RSKM |

| | | | | | | | | | | | | | | | | | | |
|------------------------------------|-----|---|---|---|---|----|----|----|---|---|---|---|---|---|---|---|---|---------------|
| <i>S. speciosa</i> (Cresson, 1865) | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | Krombein 1979 |
| <i>S. tuberculata</i> (Fox, 1895) | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |

● ¹ Excluded species: *S. spinifera* (Mickel, 1916), AB-Strickland 1947, misidentification of *S. speciosa*. ● ² *S. p. plana* (Fox, 1895).

TRIBE STIZINI COSTA, 1859

Genus *Stizoides* Guérin–Méneville, 1844

Revision – Ohl 1999.

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|----|---|---|---|---|---|---|---|---|---|---------------|
| <i>S. renicinctus</i> (Say, 1823) ¹ | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | SK-iNat 2023b |
|--|-----|---|---|---|---|----|----|----|---|---|---|---|---|---|---|---|---|---------------|

● ¹ ON: likely recorded in error, see discussion in Buck (2004).

SUBFAMILY NYSSONINAE LATREILLE, 1804

Genus *Epinysson* Pate, 1935

| | | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|----|----|----|----|----|---|---|---|---|---|---|---|------------------|
| <i>E. bellus</i> (Cresson, 1882) | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | PMAE; RSKM |
| <i>E. mellipes</i> (Cresson, 1882) ¹ | CAN | – | – | – | – | – | AB | SK | MB | ON | – | – | – | – | – | – | – | AB-PMAE; SK-RSKM |
| <i>E. metathoracicus</i> (H. Smith, 1908) | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>E. moestus</i> (Cresson, 1882) | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>E. pacificus</i> (Rohwer, 1917) | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | SMDV |
| <i>E. tramosericus</i> (Viereck, 1904) | CAN | – | – | – | – | – | – | – | MB | ON | – | – | – | – | – | – | – | |
| <i>E. tuberculatus</i> (Handlirsch, 1887) | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | – | DEBU |

● ¹ BC-Krombein 1979: likely in error (locality and depository unknown).

Genus *Hyponysson* Cresson, 1882

Revision – Pate 1938.

| | | | | | | | | | | | | | | | | | | |
|---------------------------------|-----|---|---|---|---|----|----|----|----|---|---|---|---|---|---|---|---|---------------------------|
| <i>H. bicolor</i> Cresson, 1882 | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | AB-PMAE; SK-RSKM; MB-CMNC |
|---------------------------------|-----|---|---|---|---|----|----|----|----|---|---|---|---|---|---|---|---|---------------------------|

Genus *Nysson* Latreille, 1802 ¹

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|---|---|---|
| <i>N. aequalis</i> Patton, 1879 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | – | DEBU |
| <i>N. chumash</i> Pate, 1940 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>N. daeckei</i> Viereck, 1904 | CAN | – | – | NT | – | – | AB | SK | MB | ON | QC | NB | – | NS | – | – | – | NT-UASM; AB-PMAE |
| <i>N. fidelis</i> Cresson, 1882 | CAN | AK | YT | NT | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | NT-UASM; MB-WRME |
| <i>N. freygessneri</i> Handlirsch, 1887, sp. restit. ² | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>N. gagates</i> Bradley, 1920 | CAN | AK | YT | – | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | AK-UAM; QC-LEMQ |
| <i>N. hesperus</i> R. Bohart, 1968 | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | – | NB | – | – | – | – | – | MB-WRME; ON-DEBU |
| <i>N. lateralis</i> Packard, 1867 | CAN | – | – | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | NT-UASM; BC-iNat 2021h; AB-PMAE; SK-RSKM; PE-iNat 2023c |
| <i>N. neorusticus</i> R. Bohart, 1968 | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | AB-PMAE |
| <i>N. plagiatu</i> s Cresson, 1882 | CAN | – | – | – | – | BC | AB | SK | – | ON | QC | – | – | – | – | – | – | BC-SMDV; AB-PMAE; SK-CMNC; QC-LEMQ |
| <i>N. recticornis</i> Bradley, 1920 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-RBCM; AB,SK-PMAE |
| <i>N. rufiventris</i> Cresson, 1882 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | SK-PMAE |
| <i>N. rusticus</i> Cresson, 1882 ³ | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>N. simplicicornis</i> Fox, 1896 | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | – | DEBU; PMAE |
| <i>N. subtilis</i> Fox, 1896 ⁴ | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | NS | – | – | – | QC-PMAE; NS-BEST |
| <i>N. tristis</i> Cresson, 1882 | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | AB-PMAE |

● ¹ Excluded species: *N. trichrus* (Mickel, 1916), QC-Krombein 1979, and subsequent authors, misidentifications of *N. gagates* (see Buck 2004). ● ² Reinstated from synonymy with *N. aurinotus* Say 1837, see Appendix 1: Taxonomy notes. ● ³ Nominate subspecies. AB-Strickland 1947: misidentification of *N. gagates*. ● ⁴ NT-Steiner 1973: misidentifications of *N. daeckei* and *N. fidelis*.

Genus *Zanysson* Rohwer, 1921

Key to North American species – Rohwer 1921.

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|---|----|---|---|---|---|---|---|---|---|------------------|
| <i>Z. texanus</i> (Cresson, 1873) ¹ | CAN | – | – | – | – | BC | AB | – | MB | – | – | – | – | – | – | – | – | AB-PMAE; MB-RSKM |
|--|-----|---|---|---|---|----|----|---|----|---|---|---|---|---|---|---|---|------------------|

● ¹ A complex of at least two species. Canadian specimens correspond to the nominate subspecies, but the validity of the subspecies have not been tested.

FAMILY CRABRONIDAE LATREILLE, 1802 ¹

● ¹ Excluded species of Bothynostethinae: *Bothynostethus distinctus* Fox, 1891, AB-Strickland 1947 (as *B. "?distinctus"*), misidentification of *Nysson gagates* (Bembicidae).

SUBFAMILY CRABRONINAE LATREILLE, 1802

TRIBE ANACRABRONINI ASHMEAD, 1899

Genus *Anacrabro* Packard, 1866

Key to species – Leclercq 1996; emendations to key – Leclercq 2007a.

A. ocellatus Packard, 1866¹ CAN – – – – – – – – MB ON QC – – – – – MB-WRME

● ¹ Nominate subspecies.

Genus *Entomognathus* Dahlbom, 1844

Key to North and Central American species – Leclercq 2012; key to eastern U.S. species – Krombein 1963.

Subgenus *Toncabua* Pate, 1944

E. lenapeorum Viereck, 1904 CAN – – – – – – – – ON QC – – – – – DEBU; PMAE

E. memorialis Banks, 1921 CAN – – – – – – – – ON – – – – –

TRIBE CRABRONINI LATREILLE, 1802

Genus *Crabro* Fabricius, 1775

Nearctic review – Bohart 1976; updates to the key by Bohart (1976) – Leclercq 2008; review of *C. bilaris* species group – Miller 1976.

| | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| <i>C. advena</i> F. Smith, 1835 ¹ | CAN | – | – | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – |
| <i>C. argusinus</i> R. Bohart, 1976 | CAN | – | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | YT-RBCM; MB-WRME; NB-BugG 2013b |
| <i>C. cingulatus</i> (Packard, 1867) | CAN | – | – | – | – | – | – | – | – | MB | – | – | – | – | – | – | – |
| <i>C. cognatus</i> Fox, 1895 | CAN | – | – | – | – | – | AB | SK | MB | ON | – | – | – | – | – | – | ON-DEBU |
| <i>C. conspicuus</i> Cresson, 1865 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |
| <i>C. cribrellifer</i> (Packard, 1867) | CAN | – | – | – | – | – | – | – | – | ON | QC | NB | PE | NS | – | – | – |
| <i>C. denningi</i> R. Bohart, 1976 | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | AB-PMAE |
| <i>C. dietrichi</i> R. Bohart, 1976 ² | CAN | – | – | – | – | – | – | – | – | – | – | – | PE | – | – | – | – |
| <i>C. digitatus</i> R. Bohart, 1976 | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | QC-LEMQ |
| <i>C. flavicrus</i> R. Bohart, 1976 | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – |
| <i>C. florissantensis</i> Rohwer, 1909 | CAN | AK | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | AK-UAM |
| <i>C. henrici</i> Krombein, 1951 | CAN | – | – | – | – | – | AB | SK | MB | ON | – | NB | – | – | – | – | ON-BMEC |
| <i>C. hispidus</i> Fox, 1895 ³ | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | PMAE |
| <i>C. largior</i> Fox, 1895 ⁴ | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | RBCM |
| <i>C. latipes</i> F. Smith, 1856 | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF | – |
| <i>C. leopardus</i> R. Bohart, 1976 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | RBCM |
| <i>C. maeklini</i> Morawitz, 1866 ⁵ = <i>C. canningi</i> Finnermore, 1988, syn. nov. | CAN | AK | YT | NT | NU | – | – | – | – | – | – | – | – | – | – | – | AK-UAM; YT-SMDV; NU-BOLD 2024a |
| <i>C. monticola</i> (Packard, 1867) | CAN | AK | YT | – | – | BC | AB | SK | MB | ON | QC | NB | – | NS | LB | – | Elliot and Kurczewski 1973; AB,NS-PMAE; MB-WRME |
| <i>C. nigriceps</i> R. Bohart, 1976 | CAN | – | YT | NT | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | YT-SMDV; NT-UASM; BC,AB,SK-PMAE; MB-NOFC; ON,QC-DEBU |
| <i>C. nigrostriatus</i> R. Bohart, 1976 | CAN | – | YT | – | – | BC | – | – | – | – | – | – | – | – | – | – | YT-PMAE |
| <i>C. pallidus</i> Fox, 1895 ⁶ | CAN | AK | YT | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | AK-UAM; BC-SMDV; AB-PMAE |
| <i>C. pleuralis</i> Fox, 1895 | CAN | – | YT | – | – | BC | AB | – | – | – | – | – | – | – | – | – | YT-RBCM; Krombein 1951 |
| <i>C. snowii</i> Fox, 1896 | CAN | – | – | – | – | – | AB | SK | MB | ON | – | – | – | – | – | – | AB-PMAE; ON-DEBU |
| <i>C. tenuiglossa</i> (Packard, 1866) | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | – | – | – | – | – | – |
| <i>C. tenuis</i> Fox, 1895 ⁷ | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | – | – | – | – | – | QC-DEBU |
| <i>C. velitaris</i> R. Bohart, 1976 ⁸ | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | AB-PMAE; SK-BMEC |
| <i>C. vernalis</i> (Packard, 1867) | CAN | AK | YT | NT | – | BC | AB | – | MB | ON | QC | – | – | – | – | NF | ON-DEBU; NF-NOFC |
| <i>C. virgatus</i> Fox, 1895 ⁹ | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | BC-SMDV |

● ¹ YT-Finnermore 1988, 1997: misidentification of *C. latipes*. ● ² SK,MB-Bohart 1976: misidentifications of *C. denningi* (paratypes examined, CNC), see Results and discussion: Endemism. ● ³ See Appendix 1: Taxonomy notes. YT-Finnermore 1988, 1997: misidentification of *C. nigrostriatus*; BC-Bohart 1976: misidentification of *C. florissantensis* (CNC, BMEC); AB-Bohart 1976: likely in error (depository unknown). ● ⁴ YT-Finnermore 1988, 1997: misidentifications of *C. monticola* and *C. pleuralis*; AB-Finnermore 1997: misidentification of *C. virgatus* (CNC); AB-Bohart 1976: likely in error (no specimens at CNC or BMEC). ● ⁵ See Appendix 1: Taxonomy notes. ● ⁶ AB-Finnermore and Buckle 1999: misidentifications of *C. denningi* and *C. tenuis*. ● ⁷ BC-Ratzlaff 2016, AB-Carter 1925, AB-Strickland 1947: misidentifications of *C. flavicrus*. ● ⁸ YT-Finnermore 1988, 1997: misidentification of *C. nigriceps*; SK-Bohart 1976: depository is BMEC, not CNC. ● ⁹ ON-Bohart 1976: misidentification of *C. henrici* (BMEC).

Genus *Crossocerus* Lepeletier & Brullé, 1835

New World revision – Leclercq 2000.

Subgenus *Ablepharipus* Perkins, 1913

C. unicus (Patton, 1879) CAN – – – – – – – – *MB* ON QC – – – – – Krombein 1979; DEBU; LEMQ

Subgenus *Blepharipus* Lepeletier & Brullé, 1835

C. annulipes CAN – – – – BC *AB SK MB* ON QC NB *PE* NS – – – MB-WRME; PE-PMAE; NS-iNat 2022d
(Lepeletier & Brullé, 1935)^{§1}
C. barbipes (Dahlbom, 1845)² CAN AK YT – – BC AB – *MB* ON QC *NB* – – – *NF* – AK-UAM; MB-NOFC; NB-iNat 2019b; NF-PMAE
C. capitosus (Shuckard, 1837)[§] *CAN* – – – – – – – – *ON* – – – – – – – BIOUG
C. harringtonii (Fox, 1895) CAN *AK* – – – BC AB SK – ON QC *NB* – – – *NF* – AK,NB-PMAE; Leclercq 2000
C. impressifrons (F. Smith, 1856)³ CAN – – – – – – – – ON QC *NB* – – – – – QC-LEMQ; NB-iNat 2023d
C. leucostoma (Linnaeus, 1758) CAN *AK* YT NT – BC AB *SK MB* ON QC NB – NS *LB* NF – Krombein 1979; SK-NOFC; NF-PMAE
C. maculipennis (F. Smith, 1856) CAN *AK YT* – – BC AB *SK MB* ON QC NB – *NS* – *NF* – AK-UAM; YT-iNat 2021b; SK-RSKM; NS-BOLD 2013a; NF-PMAE
C. nigrinus (Lepeletier & Brullé, 1834) CAN AK YT *NT* – BC AB *SK MB* ON QC NB *PE* NS – NF – MB-WRME; PE-PMAE
C. nitidiventris (Fox, 1892) CAN – – – – – – – – ON QC *NB* – – – – – NB-iNat 2020c
C. stictochilos Pate, 1944 CAN – – – – – – – – ON – – – – –
C. stricklandi Pate, 1944 CAN – YT – – BC AB – – – – – – – –
C. tarsalis (Fox, 1895) CAN – – – – *BC AB* – *MB* ON QC – – *NS* – – – AB,MB-PMAE; Finnamore 1982

● ¹ Nominat subspecies. ● ² Holarctic species status questionable. The correct name for this species is likely *Crossocerus wickhamii* (Ashmead, 1899), see Appendix 1: Taxonomy notes. ● ³ AB-Finnamore 1994: misidentification of *C. leucostoma*.

Subgenus *Crossocerus* Lepeletier & Brullé, 1835¹

C. elongatulus (Vander Linden, 1829)² CAN – *YT* – – BC AB *SK MB* ON QC – – *NS* – – – Leclercq 2000; BC-SMDV; AB-PMAE; SK-RSKM; Krombein 1979
C. foxi Leclercq & Miller, 2000 *CAN* – – – – – *AB* – – – – – – – – – PMAE
C. lentus (Fox, 1895) CAN AK YT NT – BC AB *SK MB* ON QC NB – *NS* – *NF* – Leclercq 2000; NF-NOFC
C. lundbladi Kjellander, 1954 *CAN* – – – *NU* – – – – – – – – – – – BIOUG
C. maculiclypeus (Fox, 1895) CAN AK YT NT – BC AB SK *MB* ON QC NB – – LB NF – NF-NOFC
C. minimus (Packard, 1867)³ CAN – YT NT – – AB *SK MB* ON QC *NB* – – – – – YT-RBCM; SK-PMAE; MB-WRME; Krombein 1979
= *C. erigoni* (Rohwer, 1908), *syn. nov.*
C. planifemur Krombein, 1952 CAN – – – – – – – – ON – – – – – – –
C. pseudochromatipus CAN – YT – – BC *AB* – – – – – – – – – AB-UASM
Leclercq & Miller, 2000
C. similis (Fox, 1895) CAN – – – – – – – – ON – – – – – – –
C. tarsatus (Shuckard, 1837)⁴ CAN AK YT NT – BC AB *SK MB* ON QC – – NS LB NF – MB-WRME; NF-NOFC
C. wesmaeli (Vander Linden, 1829) CAN *AK YT* NT – – – – – – – – – – – AK-UAM; YT-RBCM

● ¹ Excluded species: *C. chromatipus* Pate, 1944, BC-Ratzlaff 2016, misidentification of *C. lentus*. ● ² Nominat subspecies. ● ³ See Appendix 1: Taxonomy notes. YT-Finnamore 1997: misidentifications of *C. pseudochromatipus* and *C. maculiclypeus*. Correctly recorded from YT by Leclercq (2000). ● ⁴ *C. t. planipes* (Fox, 1895).

Subgenus *Cuphocterus* Morawitz, 1866

C. binotatus Lepeletier & Brullé, 1835[§] *CAN* – – – – – – – – – *QC* – – – – – BugG 2018

Subgenus *Hoplocrabro* Thomson, 1874

C. angelicus (Kincaid, 1900)¹ CAN – – – – BC AB *SK MB* – – – – – SK-PMAE; MB-WRME

● ¹ YT-Finnamore 1997: misidentification of *C. maculiclypeus*.

Genus *Ectemnius* Dahlbom, 1845

Key to species in America north of Mexico – Bohart and Kimsey 1979; updates to the key by Bohart and Kimsey (1979) – Leclercq 2007b.

Subgenus *Clytochrysus* Morawitz, 1864

E. lapidarius (Panzer, 1803) CAN *AK YT NT* – BC AB *SK MB* ON QC *NB PE NS LB NF* –

E. ruficornis (Zetterstedt, 1838)¹ CAN **AK** YT NT – BC AB **SK MB** ON QC **NB PE** NS **LB NF** – LB-NOFC

● ¹ Nominate subspecies.

Subgenus *Ectemnius* Dahlbom, 1845

E. atriceps (Cresson, 1865)¹ CAN – – **NT** – BC AB **SK MB** ON QC **NB** – **NS** – – – NB-BIOUG; Leclercq 2007b

E. borealis (Zetterstedt, 1838) CAN **AK** YT NT – BC AB **SK MB** ON QC NB **PE** NS – **NF** –

E. dives (Lepeletier & Brullé, 1835) CAN – YT NT – BC AB **SK MB** ON QC **NB PE NS LB NF** – PE-PMAE; NF-NOFC

● ¹ AK-Krombein 1979 (as *E. corrugatus* (Packard, 1866)); misidentification of *E. borealis* (UAM).

Subgenus *Hypocrabro* Ashmead, 1899¹

E. arcuatus (Say, 1837) CAN – – NT – BC AB **SK MB** ON QC **NB PE** NS – **NF** –

E. continuus (Fabricius, 1804)² CAN **AK** YT **NT** – BC AB **SK MB** ON QC **NB PE** NS – **NF** –

E. decemmaculatus (Say, 1823)³ CAN – – – – – – – – ON – – – – – – – DEBU

E. paucimaculatus (Packard, 1866) CAN – – – – – – – – ON – – – – – – – DEBU

E. scaber (Lepeletier & Brullé, 1835)² CAN – – – – – – – – ON – – – – – – – DEBU

E. spiniferus (Fox, 1895) CAN – – – – BC AB SK – – – – – – – – SK-PMAE

E. stirpicola (Packard, 1866) CAN – – – – – **AB** – **MB** ON QC – **PE NS** – – – AB,PE-PMAE; MB-WRME; NS-iNat 2020e

E. trifasciatus (Say, 1824) CAN **AK YT** NT – BC AB SK **MB** ON QC **NB PE** NS LB NF – AK-UAM; YT-RBCM; NB-iNat 2019e

● ¹ Excluded species: *E. alpheus* Pate, 1946, BC-Ratzlaff 2016, misidentification of *E. arcuatus*. ● ² Nominate subspecies. ● ³ AB-Carter 1925 (as “*Solenius chrysarginus*” [sic!] (Lepeletier & Brullé, 1835)); misidentifications of *E. arcuatus* and *E. trifasciatus*.

Subgenus *Metacrabro* Ashmead, 1899

E. cephalotes (Olivier, 1792)^{§1} CAN **AK** – – – BC **AB** – MB ON QC **NB PE NS** – **NF** – AK-UAM; BC-SMDV; AB,MB,PE-PMAE; NB-iNat 2019c; NS-iNat 2021c; NF-iNat 2019d

E. maculosus (Gmelin, 1790) CAN – – **NT** – BC **AB SK MB** ON QC **NB PE NS** – – – NT-iNat 2022e; SK-RSKM

● ¹ MB-Wrigley 2019.

Subgenus *Protothyreopus* Ashmead, 1899

E. dilectus (Cresson, 1865) CAN – – – – BC AB SK **MB** ON **QC** – – – – – ON-DEBU; QC-PMAE

E. rufifemur (Packard, 1866)¹ CAN – – – – BC AB SK **MB** ON QC – – – – –

● ¹ Nominate subspecies.

Genus *Lestica* Billberg, 1820

Key to New World species – Leclercq 2006.

Subgenus *Solenius* Lepeletier & Brullé, 1835

L. confluenta (Say, 1837) CAN – – – – BC AB SK **MB** ON QC **NB** – **NS** – – – MB-NOFC

L. producticollis (Packard, 1866) CAN – – NT – BC AB **SK MB** ON QC **NB** – NS – – – NT-UASM

Genus *Lindenius* Lepeletier & Brullé, 1834

Key to North American species – Fox 1895.

L. armaticeps (Fox, 1895) CAN – – – – – AB SK **MB** ON QC **NB PE** – – – AB,SK,QC,NB-PMAE; MB-WRME

L. columbianus (Kohl, 1892) CAN – – – – BC **AB** – – – – – – – BC,AB-PMAE

L. errans (Fox, 1895), **sp. restit.**¹ CAN – – – – – AB SK – ON **QC** – – – – – AB,SK-PMAE; QC-LEMQ

L. montezuma (Cameron, 1891) **CAN** – – – – – **AB** – – – – – – – PMAE

● ¹ Reinstated from synonymy with *L. columbianus*, see Appendix 1: Taxonomy notes.

Genus *Rhopalum* Stephens, 1829

New World revision – Leclercq 2002; review of species in America north of Mexico – Bohart 1974.

Subgenus *Corynopus* Lepeletier & Brullé, 1835

R. coarctatum (Scopoli, 1763) CAN **AK** YT **NT** – BC AB **SK MB** ON QC **NB** – **NS** – **NF** – AK-UAM; SK-RSKM; NB-BugG 2014b; NS-PMAE

R. gracile Wesmael, 1852[§] **CAN** – – – – **BC** – – – – – – – – – Ratzlaff et al. 2016

R. occidentale (Fox, 1895) CAN – – – – BC **AB** – **MB** ON QC NB – – – – – AB-PMAE

R. pedicellatum Packard, 1867 CAN – – – – – – – – ON QC – – – – –

R. rufigaster Packard, 1867 CAN – – – – – – – – ON QC – – – – –

Subgenus *Rhopalum* Stephens, 1829

| | | | | | | | | | | | | | | | | | | |
|--|-----|----|----|---|---|----|----|----|----|----|----|----|----|----|---|----|---|--|
| <i>R. clavipes</i> (Linnaeus, 1758) ¹ | CAN | AK | YT | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | NF | – | AK-UAM; YT-BOLD 2024b; SK-RSKM; NB-BOLD 2014a; PE-BOLD 2014b |
|--|-----|----|----|---|---|----|----|----|----|----|----|----|----|----|---|----|---|--|

● ¹ MB-Wrigley 2019.

SUBFAMILY LARRINAE LATREILLE, 1810

TRIBE GASTROSERICINI ANDRÉ, 1886

Genus *Larropsis* Patton, 1892

Subgenus *Ancistromma* Fox, 1893

Nearctic revision – Bohart and Bohart 1962.

| | | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|----|----|----|----|----|----|----|----|----|---|---|---|------------------------------|
| <i>L. aurantia</i> (Fox, 1891) | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | SK-PMAE |
| <i>L. capax</i> (Fox, 1894) | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | MB-RSKM |
| <i>L. corrugata</i> G. Bohart & R. Bohart, 1962 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>L. distincta</i> (F. Smith, 1856) | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | NB-iNat 2019f; NS-iNat 2021d |

Subgenus *Larropsis* Patton, 1892

Revision – Bohart and Bohart 1966.

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|------|
| <i>L. tenuicornis</i> (F. Smith, 1856) | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | RBCM |
|--|-----|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|------|

Genus *Tachysphex* Kohl, 1883¹

North American revision including Central American and Caribbean species – Pulawski 1988.

| | | | | | | | | | | | | | | | | | | |
|--|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|----|---|-----------------------------------|
| <i>T. acutus</i> (Patton, 1880) | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | NB | – | – | – | – | – | AB,NB-PMAE; SK-WRME; QC-LEMQ |
| <i>T. aequalis</i> Fox, 1894 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>T. aethiops</i> (Cameron, 1865) | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | AK-UAM; YT-RBCM; MB-WRME; QC-LEMQ |
| <i>T. alpestris</i> Rohwer, 1908 | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | – | – | – | – | – | – | – | Pulawski 1988; YT-SMDV; NT-UASM |
| <i>T. amplus</i> Fox, 1894 ² | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>T. antennatus</i> Fox, 1894 | CAN | – | – | – | – | BC | – | – | – | ON | – | – | – | – | – | – | – | |
| <i>T. apicalis</i> Fox, 1893 | CAN | – | – | – | – | BC | AB | SK | – | ON | – | – | – | – | – | – | – | SK-PMAE; ON-DEBU |
| <i>T. ashmeadii</i> Fox, 1894 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-RBCM; SK-CMNC |
| <i>T. clarconis</i> Viereck, 1906 ³ | CAN | – | – | – | – | BC | – | SK | – | – | – | – | – | – | – | – | – | SK-UASM |
| <i>T. crassiformis</i> Viereck, 1906 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>T. eldoradensis</i> Rohwer, 1917 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>T. hopi</i> Pulawski, 1988 | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | BC-RBCM; AB-PMAE |
| <i>T. huchiti</i> Pulawski, 1988 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | PMAE; RSKM |
| <i>T. linsleyi</i> R. Bohart, 1962 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>T. montanus</i> (Cresson, 1865) | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | Pulawski 1988; AB,SK-PMAE |
| <i>T. mundus</i> Fox, 1894 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-RBCM |
| <i>T. orestes</i> Pulawski, 1988 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | Pulawski 1988 |
| <i>T. paiute</i> Pulawski, 1988 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>T. paucillus</i> Fox, 1894 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>T. pechumani</i> Krombein, 1938 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | – | |
| <i>T. pompiliiformis</i> (Panzer, 1804) | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | NF | – | NB-PMAE; NF-NOFC |
| <i>T. psammobius</i> (Kohl, 1880) | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | AB,SK-PMAE; MB-CMNC |
| <i>T. punctifrons</i> (Fox, 1891) ⁴ | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | – | SK-PMAE |
| <i>T. scopaeus</i> Pulawski, 1988 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | AB,SK-PMAE |
| <i>T. semirufus</i> (Cresson, 1865) | CAN | – | YT | – | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | AB,QC-PMAE; MB-WRME |
| <i>T. similis</i> Rohwer, 1910 | CAN | – | – | NT | – | BC | AB | SK | MB | ON | QC | NB | – | – | – | – | – | NT-UASM; Scudder 1994 |
| <i>T. sonorensis</i> (Cameron, 1889) | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | AB,SK-PMAE |
| <i>T. tarsatus</i> (Say, 1823) | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | |
| <i>T. terminatus</i> (F. Smith, 1856) ⁵ | CAN | – | – | – | – | – | AB | – | MB | ON | QC | NB | PE | NS | – | – | – | NB-BugG 2013c |

| | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|---|----|----|----|----|---|---|---|---|---|---|------------------|
| <i>T. texanus</i> (Cresson, 1873) | CAN | - | - | - | - | - | AB | SK | - | ON | - | - | - | - | - | - | AB-PMAE; SK-RSKM |
| <i>T. williamsi</i> R. Bohart, 1962 ⁶ | CAN | - | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | BC-RBCM |
| ● ¹ Excluded species: <i>T. verticalis</i> Pulawski, 1982, BC-Ratzlaff 2016, misidentification of <i>T. pompiliiformis</i> ; <i>T. hurdi</i> R. Bohart, 1962, AB-Finnamore and Buckle 1999, misidentification of <i>T. psammobius</i> . ● ² BC-Ratzlaff 2016: misidentification of <i>T. tarsatus</i> . ● ³ Expected in AB, SK record 1 km E of AB border. ● ⁴ ON-Buck et al. 2006: misidentification of <i>T. acutus</i> . ● ⁵ NT-Steiner 1973: misidentifications of <i>T. alpestris</i> and <i>T. similis</i> , SK-Krombein 1979; likely misidentifications of <i>T. alpestris</i> . ● ⁶ BC-Ratzlaff 2016: misidentification of <i>T. pompiliiformis</i> . | | | | | | | | | | | | | | | | | |

Genus *Tachytes* Panzer, 1806

Key to species in America north of Mexico – Bohart 1994a.

| | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|----|----|----|----|----|----|----|---|---|---|---|---------------------------|
| <i>T. aurulentus</i> (Fabricius, 1804) | CAN | - | - | - | - | - | AB | SK | MB | ON | - | - | - | - | - | - | AB-PMAE; SK-RSKM; MB-WRME |
| <i>T. crassus</i> Patton, 1880 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | |
| <i>T. distinctus</i> F. Smith, 1856 ¹ | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | |
| <i>T. fulviventris</i> Cresson, 1865 | CAN | - | - | - | - | - | AB | - | - | - | - | - | - | - | - | - | |
| <i>T. harpax</i> Patton, 1880 | CAN | - | - | - | - | - | - | - | - | ON | QC | NB | - | - | - | - | DEBU; RSKM; PMAE |
| <i>T. intermedius</i> (Viereck, 1906) | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | DEBU |
| <i>T. mergus</i> Fox, 1892 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | PMAE |
| <i>T. nevadensis</i> R. Bohart, 1962 | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | RBCM |
| <i>T. obductus</i> Fox, 1892 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | PMAE |
| <i>T. pennsylvanicus</i> Banks, 1921 | CAN | - | - | - | - | BC | AB | SK | MB | ON | QC | - | - | - | - | - | SK-RSKM; MB-WRME; QC-LEMQ |
| <i>T. pepticus</i> (Say, 1937) ² | CAN | - | - | - | - | - | AB | - | - | - | - | - | - | - | - | - | PMAE |
| <i>T. sayi</i> Banks, 1942 | CAN | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | - | BC-RSKM; AB,SK-PMAE |
| <i>T. validus</i> Cresson, 1873 | CAN | - | - | - | - | - | - | - | MB | ON | QC | - | - | - | - | - | |
| ● ¹ Nominate subspecies. ● ² AB-Carter 1925, AB-Strickland 1947: misidentifications of <i>T. pennsylvanicus</i> . | | | | | | | | | | | | | | | | | |

TRIBE LARRINI LATREILLE, 1810

Genus *Larra* Fabricius, 1793

New World revision – Menke 1992.

| | | | | | | | | | | | | | | | | | |
|----------------------------------|-----|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|------|
| <i>L. analis</i> Fabricius, 1804 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | DEBU |
|----------------------------------|-----|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|------|

Genus *Liris* Fabricius, 1804

North American revision – Krombein and Shanks Gingras 1984.

Subgenus *Leptolarra* Cameron, 1900

| | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|---|---|----|---|---|---|---|---|---|---------|
| <i>L. argentatus</i> (Palisot de Beauvois, 1811) | CAN | - | - | - | - | BC | AB | - | - | ON | - | - | - | - | - | - | AB-PMAE |
| <i>L. beatus</i> (Cameron, 1889) | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | DEBU |

SUBFAMILY MISCOPHINAE FOX, 1894

Genus *Lyroda* Say, 1837 ¹

Key to North American species – Fox 1894a.

| | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|---|----|----|----|----|----|----|---|----|---|---|---------|
| <i>L. subita</i> Say, 1837 | CAN | - | - | - | - | - | AB | SK | MB | ON | QC | NB | - | NS | - | - | AB-PMAE |
| ● ¹ Excluded species: <i>Lyroda triloba</i> (Say, 1837), CAN-Cresson 1887 and subsequent authors, likely misidentification(s) of <i>L. subita</i> (locality and depository unknown). | | | | | | | | | | | | | | | | | |

Genus *Miscophus* Jurine, 1807

New World revision – Slansky Wasbauer 1978.

Subgenus *Miscophus* Jurine, 1807

| | | | | | | | | | | | | | | | | | |
|--|-----|---|---|----|---|---|----|----|----|----|----|---|---|---|---|---|---------------------------|
| <i>M. americanus</i> Fox, 1890 | CAN | - | - | NT | - | - | AB | SK | MB | ON | QC | - | - | - | - | - | NT-UASM; SK-PMAE; MB-WRME |
| <i>M. ater</i> Lepeletier, 1845 [§] | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | DEBU |

Subgenus *Nitelopterus* Ashmead, 1897 ¹

| | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|----|----|---|---|---|---|---|---|---|---------|
| <i>M. arenarum</i> Cockerell, 1898 | CAN | - | - | - | - | - | AB | - | MB | - | - | - | - | - | - | - | AB-PMAE |
| <i>M. californicus</i> (Ashmead, 1898) | CAN | - | - | - | - | - | AB | SK | - | - | - | - | - | - | - | - | SK-CMNC |
| <i>M. cyanurus</i> (Rohwer, 1909) | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | SMDV |

● ¹ Excluded species: *M. evansi* (Krombein, 1963), BC-Scudder 1994, and BC-Ratzlaff 2016, misidentifications of *M. cyanurus*.

Genus *Nitela* Latreille, 1809

Key to Nearctic species – Pate 1937.

| | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|---|---|---|---|----|----|---|---|---|---|---|------------|
| <i>N. cerasicola</i> Pate, 1937 | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | DEBU; PMAE |
| <i>N. virginensis</i> Rohwer, 1923 ¹ | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | |

● ¹ Misspelled “*virginiensis*” by many subsequent authors, e.g., Krombein (1979).

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|----|---|---|
| <i>O. subulatus</i> Robertson, 1889 ⁵ | CAN | - | - | - | - | BC | AB | SK | MB | ON | QC | - | - | - | - | - | - | BC-SMDV; SK- PMAE; MB-WRME; QC-LEMQ |
| <i>O. uniglutinis</i> (Linnaeus, 1758) | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | PE | NS | - | NF | - | NB,PE-PMAE |
| <i>O. ventralis</i> Fox, 1894 ⁵ | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | |
| ● ¹ Excluded species: <i>O. parvus</i> Cresson, 1865 (as <i>O. coloradensis</i> Baker, 1896), AB-Strickland 1947, misidentification of <i>O. pacificus</i> . ● ² Nominate subspecies. ● ³ BC-Bohart and Schlinger 1957 and subsequent authors: misidentifications of <i>O. pacificus</i> ; AB,SK-Bohart and Schlinger 1957 and subsequent authors: probably referring in part to <i>O. pacificus</i> , see note under the latter. ● ⁴ Reinstated from synonymy with <i>O. emarginatus</i> , see Appendix 1: Taxonomy notes. ● ⁵ <i>O. subulatus</i> intergrades with <i>O. ventralis</i> in SK, AB and BC; further study is needed. | | | | | | | | | | | | | | | | | | |

SUBFAMILY TRYPOXYLINAE LEPELETIER, 1845

Genus *Pison* Jurine, 1808

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|---|------|
| New World revision – Menke 1988; review of <i>P. agile</i> -group – Antropov 1994. | | | | | | | | | | | | | | | | | | |
| <i>P. koreense</i> (Radoszkowski, 1887) [§] | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | DEBU |

Genus *Pisonopsis* Fox, 1893

| | | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|----|----|----|---|---|---|---|---|---|---|---|---|------------|
| Key to species – Menke 1988; North American revision – Williams 1954. | | | | | | | | | | | | | | | | | | |
| <i>P. birkmanni</i> Rohwer, 1909 | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | SMDV |
| <i>P. chypeata</i> Fox, 1893 | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | SMDV; PMAE |
| <i>P. triangularis</i> Ashmead, 1899 | CAN | - | - | - | - | - | AB | SK | - | - | - | - | - | - | - | - | - | AB,SK-PMAE |

Genus *Trypoxylon* Latreille, 1796

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|---|---|---|----|----|---|---|---|---|---|---|---------------|
| Nearctic review – Sandhouse 1940. | | | | | | | | | | | | | | | | | | |
| Subgenus <i>Trypargilum</i> Richards, 1934 | | | | | | | | | | | | | | | | | | |
| North American revision – Coville 1982. | | | | | | | | | | | | | | | | | | |
| <i>T. clavatum</i> Say, 1837 ¹ | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | |
| <i>T. collinum</i> F. Smith, 1856 ² | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-PMAE |
| <i>T. lactitarse</i> de Saussure, 1867 | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-iNat 2021e |
| <i>T. politum</i> Say, 1837 | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-iNat 2022f |
| <i>T. tridentatum</i> Packard, 1867 ¹ | CAN | - | - | - | - | BC | - | - | - | ON | - | - | - | - | - | - | - | |

● ¹ Nominate subspecies. ● ² *T. c. rubrocinctum* Packard, 1867.

Subgenus *Trypoxylon* Latreille, 1796

| | | | | | | | | | | | | | | | | | | |
|--|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|---|------------|
| Key to Nearctic species of the <i>T. figulus</i> -group – Antropov 2003. | | | | | | | | | | | | | | | | | | |
| <i>T. attenuatum</i> F. Smith, 1851 [§] | CAN | - | - | - | - | BC | - | - | - | ON | QC | - | - | - | - | - | - | BC,QC-PMAE |
| <i>T. bidentatum</i> Fox, 1891 ¹ | CAN | - | - | - | - | BC | - | - | - | ON | - | - | - | - | - | - | - | |
| <i>T. carinatum</i> Say, 1837 | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-IMQC |
| <i>T. clarkei</i> Krombein, 1962 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | |
| <i>T. clavicerum</i> Lepeletier & Serville, 1828 ^{§2} | CAN | - | - | - | - | BC | - | - | - | ON | QC | - | - | - | - | - | - | BC,QC-PMAE |
| <i>T. fastigium</i> Fox, 1894 | CAN | - | - | - | - | - | AB | - | - | - | - | - | - | - | - | - | - | PMAE |
| <i>T. figulus</i> (Linnaeus, 1758) ^{§3} | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-DEBU |
| <i>T. frigidum</i> F. Smith, 1856 ³ | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF | - | AK,NS-PMAE |
| <i>T. johnsoni</i> Fox, 1891 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | |
| <i>T. kolazyi</i> Kohl, 1893 [§] | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | |
| <i>T. pennsylvanicum</i> de Saussure, 1867 ⁴ | CAN | - | - | - | - | BC | AB | SK | MB | ON | QC | NB | - | NS | - | NF | - | NB-LEMQ |
| <i>T. richardsi</i> Sandhouse, 1940 | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | |

● ¹ ON-Buck 2004: occurrence status uncertain, based on a single specimen, possibly adventitious. ● ² Including *T. kostylevi* Antropov, 1985, a suspected synonym; see Appendix 1: Taxonomy notes. ● ³ Nominate subspecies. ● ⁴ Including *T. sculleni* Sandhouse, 1940, a probable synonym: BC-Sandhouse 1940, AB-Finnamore 1994, ON-Buck 2004 (fide Antropov in litt.); see Appendix 1: Taxonomy notes.

FAMILY MELLINIDAE LATREILLE, 1802

Genus *Mellinus* Fabricius, 1790

| | | | | | | | | | | | | | | | | | | |
|-------------------------------------|-----|---|---|---|---|---|----|----|----|----|----|---|---|---|---|---|---|------------------|
| Review – Siri and Bohart 1974. | | | | | | | | | | | | | | | | | | |
| <i>M. abdominalis</i> Cresson, 1882 | CAN | - | - | - | - | - | AB | SK | MB | ON | - | - | - | - | - | - | - | MB-PMAE; ON-DEBU |
| <i>M. bimaculatus</i> Packard, 1867 | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | |

FAMILY PEMPHREDONIDAE DAHLBOM, 1835

SUBFAMILY PEMPHREDONINAE DAHLBOM, 1835

Genus *Diodontus* Curtis, 1834 ¹

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|---|---|----|----|----|---|----|----|----|---|---|---|---|---|------------------|
| Revision of species in America north of Mexico – Eighme 1989. | | | | | | | | | | | | | | | | | | |
| <i>D. adamsi</i> Titus, 1909 | CAN | AK | YT | - | - | BC | AB | SK | - | ON | QC | NB | - | - | - | - | - | SK-DEBU; QC-LEMQ |

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|---|----|---|---|---|-----------------------------------|
| <i>D. americanus</i> Packard, 1867 ² | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | – | NS | – | – | – | NS-LEMQ |
| = <i>D. gillettei</i> Fox, 1892, syn. nov. | | | | | | | | | | | | | | | | | | |
| = <i>D. rugosus</i> Fox, 1892, syn. nov. | | | | | | | | | | | | | | | | | | |
| = <i>D. florissantensis</i> Rohwer, 1909, syn. rev. | | | | | | | | | | | | | | | | | | |
| = <i>D. bidentatus</i> Rohwer, 1911, syn. nov. | | | | | | | | | | | | | | | | | | |
| = <i>D. siouxensis</i> (Mickel, 1916), syn. nov. | | | | | | | | | | | | | | | | | | |
| = <i>D. striatus</i> (Mickel, 1916), syn. nov. | | | | | | | | | | | | | | | | | | |
| <i>D. argentinae</i> Rohwer, 1909 | CAN | – | YT | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | AB-PMAE |
| <i>D. boharti</i> Eighme, 1983 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>D. crassicornus</i> Viereck, 1904 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>D. flavitarsis</i> Fox, 1892 ³ | CAN | – | – | NT | – | – | AB | SK | MB | – | – | – | – | – | – | – | – | |
| <i>D. fraternus</i> Rohwer, 1909 ⁴ | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-RSKM |
| <i>D. leguminiferus</i> Cockerell, 1897 ⁵ | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | SMDV; PMAE |
| <i>D. metathoracicus</i> (Mickel, 1916) ⁶ | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>D. minutus</i> (Fabricius, 1793) ⁵ | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | AB-PMAE; SK-RSKM; MB-WRME |
| <i>D. neomexicanus</i> Rohwer, 1909 ⁷ | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-SMDV; AB,SK-PMAE |
| <i>D. nigrinus</i> Fox, 1892, sp. restit. ⁸ | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | – | – | – | – | – | – | – | AK-UAM; YT-SMDV; NT-UASM; MB-WRME |
| = <i>D. vallicolae</i> Rohwer, 1909, syn. nov. | | | | | | | | | | | | | | | | | | |
| = <i>D. vallicolae salicis</i> Rohwer, 1909, syn. rev. | | | | | | | | | | | | | | | | | | |
| = <i>D. ater</i> (Mickel, 1916), syn. rev. | | | | | | | | | | | | | | | | | | |
| = <i>D. maestus</i> (Mickel, 1916), syn. rev. | | | | | | | | | | | | | | | | | | |
| <i>D. spiniferus</i> (Mickel, 1916) ⁹ | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | |
| <i>D. virginianus</i> (Rohwer, 1917) ¹⁰ | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | – | QC-LEMQ |

● ¹ The concepts of six species have been revised, see Appendix 1: Taxonomy notes. Excluded species: *D. occidentalis*, YT-Ratzlaff 2018, misidentifications of *D. americanus* and an undescribed species; BC-Ratzlaff 2016, misidentification of *D. neomexicanus*; AB-Finnamore 1994, misidentifications of *D. americanus*; AB-Finnamore and Buckle 1999, misidentification of an undescribed species. ● ² Previously recorded from Canada/Alaska as *D. bidentatus* and *D. siouxensis*, see Appendix 1: Taxonomy notes. BC-Blades and Maier 1996 and BC-Ratzlaff 2016 (as *D. striatus*): misidentifications of an undescribed species. YT-Finnamore 1997 (as *D. “rugulosus”*, misspelling): misidentifications of *D. spiniferus* and an undescribed species; AB-Strickland 1947 (as *D. florissantensis*): misidentification of an undescribed species. AB-Finnamore and Buckle 1999 (as *D. bidentatus*): most are misidentifications of an undescribed species. ● ³ Species concept revised, see Appendix 1: Taxonomy notes. YT-Finnamore 1997: misidentifications of *D. argentinae* and *D. adamsi*. BC-Ratzlaff 2016: misidentifications of *D. nigrinus* and *D. adamsi*. ON-Buck 2004: misidentifications of *D. nigrinus* (males) and an undescribed species (females). ● ⁴ Species concept revised, see Appendix 1: Taxonomy notes. BC-Ratzlaff 2016: misidentifications of *D. neomexicanus* and an undescribed species. AB-Finnamore and Buckle 1999: misidentification of an undescribed species. ● ⁵ Species concept revised, see Appendix 1: Taxonomy notes. BC-Scudder (1994) and subsequent authors: misidentification of a probably undescribed species near *D. metathoracicus*; YT-Ratzlaff 2018: misidentification of an undescribed species. ● ⁶ Part of a species complex, see Appendix 1: Taxonomy notes. Two similar, undescribed species occur in BC, AB, SK. ● ⁷ Species concept revised, see Appendix 1: Taxonomy notes. AB-Finnamore and Buckle 1999: misidentification of an undescribed species. ● ⁸ Reinstated from synonymy with *D. flavitarsis* and species concept revised, see Appendix 1: Taxonomy notes. ON specimens are atypical and might be referable to a different species. ● ⁹ Eighme (1989) as *D. spinifer*: unjustified emendation. ● ¹⁰ Species concept revised, see Appendix 1: Taxonomy notes. BC-Ratzlaff 2016: misidentification of *D. leguminiferus*.

Genus *Passaloecus* Shuckard, 1837

Revision of species in America north of Mexico – Vincent 1979.¹

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|---|---|---|
| <i>P. annulatus</i> (Say, 1837) | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | BC,NB,PE-PMAE; SK-RSKM |
| <i>P. areolatus</i> Vincent, 1979 ¹ | CAN | – | – | – | – | – | – | – | – | ON | QC | NB | PE | – | – | – | – | QC-LEMQ; PE-PMAE |
| <i>P. armeniacae</i> Cockerell, 1897 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>P. borealis</i> Dahlbom, 1844 | CAN | AK | YT | NT | – | BC | AB | – | MB | ON | QC | – | – | – | – | – | – | AK-UAM; YT,BC-PMAE; MB,NF-NOFC; ON-DEBU |
| <i>P. cuspidatus</i> F. Smith, 1856 | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | – | NS | – | – | – | |
| <i>P. eremita</i> Kohl, 1893 ⁵ | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | – | BOLD 2011; PMAE |
| <i>P. gracilis</i> (Curtis, 1834) ⁵ | CAN | – | – | – | – | BC | AB | – | – | ON | QC | – | – | – | – | – | – | BC-SMDV; AB-PCYU; QC-PMAE |
| <i>P. lineatus</i> Vincent, 1979 ¹ | CAN | – | – | – | – | BC | AB | – | – | ON | QC | – | – | – | – | – | – | |
| <i>P. melanocrus</i> Rohwer, 1911 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | Vincent 1979 |
| <i>P. monilicornis</i> Dahlbom, 1842 ² | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | MB,PE-PMAE; NS-RSKM |

| | | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|----|---|---|---|----|----|----|---|----|---|----|---|---------------------------|
| <i>P. patagiatus</i> Vincent, 1979 ¹ | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | - |
| <i>P. singularis</i> Dahlbom, 1844 [§] | CAN | - | - | - | - | BC | - | - | - | ON | QC | NB | - | NS | - | NF | - | NB-LEMQ; NS-BOLD 2013b |

● ¹ Actual publication date is 23 May 1979, not 1978 as printed (see Pulawski 2025). ● ² MB-Wrigley 2019.

Genus *Pemphredon* Latreille, 1796

World revision – Dollfuss 1995.

| | | | | | | | | | | | | | | | | | | |
|--|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|---|---|
| <i>P. baltica</i> Merisuo, 1972 | CAN | AK | YT | NT | - | BC | AB | - | - | ON | QC | NB | - | - | - | - | - | AK-UAM; BC,AB- PMAE; ON-DEBU |
| <i>P. bipartior</i> Fox, 1892, sp. restit. ¹ | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-PMAE |
| <i>P. confertim</i> Fox, 1892 ² | CAN | - | - | - | - | BC | AB | SK | - | - | - | - | - | - | - | - | - | AB-PMAE; SK-RSKM |
| <i>P. foxii</i> Rohwer, 1917 | CAN | - | - | NT | - | - | AB | - | MB | ON | QC | NB | - | - | - | - | - | NT-BIOUG; AB,MB- PMAE |
| <i>P. grinnelli</i> (Rohwer, 1910) | CAN | - | - | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | |
| <i>P. inornata</i> Say, 1824 | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | PE | NS | - | NF | - | PE-PMAE |
| <i>P. lethifer</i> (Shuckard, 1837) [§] | CAN | - | - | - | - | BC | AB | - | - | ON | QC | NB | PE | NS | - | NF | - | BC,AB-PMAE; Dollfuss 1995 |
| <i>P. lugubris</i> (Fabricius, 1793) ³ | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | - | NS | LB | NF | - | NT,SK-RSKM; MB,NB- BIOUG; NS-PMAE; LB-NOFC |
| <i>P. menkei</i> R. Bohart, 1993 | CAN | AK | YT | NT | - | - | AB | SK | MB | ON | QC | NB | PE | NS | - | NF | - | AK,NT,AB,NF-PMAE; SK,NS-BIOUG; MB- NOFC; Dollfuss 1995 |
| <i>P. montana</i> Dahlbom, 1845 ³ | CAN | AK | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | PE | NS | - | NF | - | SK-RSKM |
| <i>P. morio</i> vander Linden, 1829 [§] | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | NS | - | - | - | DEBU; BIOUG |
| <i>P. mortifer</i> Valkeila, 1972 ^{§4} | CAN | - | - | - | - | - | - | - | - | ON | QC | - | - | - | - | - | - | QC-LEMQ |
| <i>P. nearctica</i> Kohl, 1890 ⁵ | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | |
| <i>P. pulawskii</i> Dollfuss, 1993 | CAN | - | - | - | - | - | AB | - | - | ON | - | - | - | - | - | - | - | AB,ON-PMAE |
| <i>P. rileyi</i> Fox, 1892 ⁶ | CAN | - | YT | - | - | BC | - | - | - | - | - | - | - | - | - | - | - | SMDV; PMAE |

● ¹ Reinstated from synonymy with *P. rugifer* (Dahlbom, 1844), see Appendix 1: Taxonomy notes and note 4. NT-Steiner 1973: misidentification of *P. inornata*. ● ² YT-Finnamore 1997: misidentifications of *P. menkei* and *P. rileyi*. ● ³ Holarctic species status questionable, see Appendix 1: Taxonomy notes. ● ⁴ Incorrectly synonymized with *P. rugifer* (Dahlbom, 1844) by Dollfuss (1995), see Appendix 1: Taxonomy notes. ● ⁵ YT-Finnamore 1997: misidentifications of *P. menkei*. ● ⁶ AB-Carter 1925, AB-Strickland 1947: misidentification of *P. montana*.

SUBFAMILY SPILOMENINAE MENKE, 1889

Genus *Spilomena* Shuckard, 1838

Key to species in America north of Mexico – Bohart and Smith 1995.

| | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|----|---|----|----|----|---|---|---|---|---|---------------------|
| <i>S. alboclypeata</i> Bradley, 1906 | CAN | - | - | - | - | BC | AB | SK | - | - | QC | NB | - | - | - | - | - | AB,SK-PMAE; QC-LEMQ |
| <i>S. ampliceps</i> Krombein, 1952 | CAN | - | - | - | - | - | - | - | - | ON | - | NB | - | - | - | - | - | |
| <i>S. barberi</i> Krombein, 1952 | CAN | - | - | - | - | BC | - | - | - | ON | QC | - | - | - | - | - | - | QC-LEMQ |
| <i>S. clypearis</i> N. Smith, 1995 | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | SMDV; PMAE |
| <i>S. foxii</i> Cockerell, 1897 | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | |
| <i>S. occidentalis</i> R. Bohart, 1995 | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | BC,AB-PMAE |
| <i>S. pusilla</i> (Say, 1837) | CAN | - | - | - | - | - | - | - | - | ON | - | - | - | - | - | - | - | |
| <i>S. troglodytes</i> (vander Linden, 1829) [§] | CAN | - | - | - | - | BC | - | - | - | ON | QC | - | - | - | - | - | - | ON-DEBU; QC-PMAE |

SUBFAMILY STIGMINAE R. BOHART & MENKE, 1976

Genus *Stigmus* Panzer, 1804

Key to North American species – Krombein 1973.

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|---|----|----|----|---|---------------------------------------|
| <i>S. americanus</i> Packard, 1867 ¹ | CAN | - | YT | NT | - | BC | AB | SK | MB | ON | QC | NB | - | NS | LB | NF | - | YT-BOLD 2016b; NS-PMAE; NF-BOLD 2010a |
| <i>S. fraternus</i> Say, 1824 ¹ | CAN | AK | - | - | - | BC | AB | - | - | ON | QC | - | - | NS | - | NF | - | AB,NS-PMAE |
| <i>S. fulvicornis</i> Rohwer, 1923 ² | CAN | - | - | - | - | BC | AB | - | - | ON | QC | - | - | - | - | - | - | BC,ON-PMAE; QC-BOLD 2014c |
| <i>S. fulvipes</i> Fox, 1892 | CAN | - | - | - | - | BC | AB | - | - | - | - | - | - | - | - | - | - | AB-PMAE |
| <i>S. inordinatus</i> Fox, 1892 ³ | CAN | - | - | - | - | BC | - | - | - | ON | - | - | - | - | - | - | - | ON-PMAE |

● ¹ *S. americanus* and *S. fraternus* are part of a cryptic species complex with unclear species boundaries, see Appendix 1: Taxonomy notes. ● ² QC-BOLD 2014c based on matching DNA barcode. ● ³ *S. i. inordinatus* in BC, *S. i. universitatis* Rohwer, 1909, in ON.

FAMILY PHILANTHIDAE LATREILLE, 1802
SUBFAMILY APHILANTHOPINAE R. BOHART, 1966

Key to Nearctic genera and species - Bohart and Grissell 1975.

Genus *Aphilanthops* Patton, 1881

| | | | | | | | | | | | | | | | | | |
|-------------------------------------|-----|---|---|---|---|----|----|----|----|----|----|----|----|----|---|---|---|
| <i>A. frigidus</i> (F. Smith, 1856) | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – |
| <i>A. subfrigidus</i> Dunning, 1898 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |

Genus *Clypeadon* Patton, 1897

| | | | | | | | | | | | | | | | | | |
|---------------------------------------|-----|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|
| <i>C. laticinctus</i> (Cresson, 1865) | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |
|---------------------------------------|-----|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|

SUBFAMILY CERCERINAE LEPELETIER, 1845

Genus *Cerceris* Latreille, 1802 ¹

Synonymic list of North American and Caribbean species – Ferguson 1984b²; review of species in America north of Mexico – Scullen 1965; key to eastern Canadian species – Buck et al. 2006.

| | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|---|---|
| <i>C. aequalis</i> Provancher, 1888 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |
| <i>C. arelate</i> Banks, 1912 | CAN | – | – | – | – | – | – | SK | MB | ON | QC | NB | – | NS | – | – | NB-PMAE; NS-iNat 2023e |
| <i>C. astarte</i> Banks, 1913 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | – |
| <i>C. atramontensis</i> Banks, 1913 | CAN | – | – | NT | – | – | AB | SK | MB | ON | QC | NB | PE | NS | – | – | AB-PMAE; NB-BugG 2013d; PE-iNat 2021f; NS-iNat 2023f |
| <i>C. bicornuta</i> Guérin-Ménéville, 1844 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | DEBU |
| <i>C. californica</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | AB-PMAE; SK-RSKM |
| <i>C. calochorti</i> Rohwer, 1908 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | BC-RBCM; AB,SK-PMAE |
| <i>C. chypeata</i> Dahlbom, 1844 ³ | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | QC-iNat 2020f |
| <i>C. cockerelli</i> Viereck, 1903 ⁴ | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | AB,SK-PMAE |
| <i>C. compacta</i> Cresson, 1865 ⁵ | CAN | – | – | – | – | – | AB | – | – | ON | – | – | – | – | – | – | AB-PMAE |
| <i>C. compar</i> Cresson, 1865 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | PMAE |
| <i>C. confrons</i> Mickel, 1916 | CAN | – | – | – | – | – | AB | – | MB | – | – | – | – | – | – | – | MB-WRME |
| <i>C. convergens</i> Viereck & Cockerell, 1904 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |
| <i>C. crucis</i> Viereck & Cockerell, 1904 ⁶ | CAN | – | – | – | – | – | AB | SK | – | ON | – | – | – | – | – | – | SK-RSKM |
| <i>C. dentifrons</i> Cresson, 1865 | CAN | – | – | – | – | – | – | – | MB | ON | QC | – | – | – | – | – | MB-WRME; QC-LEMQ |
| <i>C. deserta</i> Say, 1824 | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | NB | – | – | – | – | Scullen 1965 |
| <i>C. echo</i> Mickel, 1916 | CAN | – | – | – | – | BC | AB | SK | MB | ON | – | – | – | – | – | – | SK-RSKM; MB-WRME |
| <i>C. finitima</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | – | ON | – | – | – | – | – | – | BC,SK-RSKM; ON- DEBU |
| <i>C. fumipennis</i> Say, 1837 ⁷ | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | NB | – | – | – | – | AB-PMAE; SK-RSKM; MB-PMAE; QC-iNat 2020g; NB-iNat 2022g |
| <i>C. halone</i> Banks, 1912 ⁸ | CAN | – | – | – | – | – | – | – | MB | ON | QC | – | – | – | – | – | QC-PMAE |
| <i>C. insolita</i> Cresson, 1865 | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | DEBU; iNat 2024g |
| <i>C. jucunda</i> Cresson, 1873 | CAN | – | – | – | – | – | – | SK | – | – | – | – | – | – | – | – | RSKM |
| <i>C. kennicottii</i> Cresson, 1865 ⁹ | CAN | – | – | – | – | – | AB | SK | – | ON | – | – | – | – | – | – | AB-PMAE; SK-RSKM |
| <i>C. nigrescens</i> F. Smith, 1856 | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | – | PE | NS | – | – | – |
| <i>C. nitidoides</i> Ferguson, 1984 ¹⁰ | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | Finnamore 1982 |
| <i>C. occipitomaculata</i> Packard, 1866 ¹¹ | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | AB-PMAE |
| <i>C. prominens</i> Banks, 1912 ¹² | CAN | – | – | – | – | – | AB | – | MB | – | – | – | – | – | – | – | AB-PMAE |
| <i>C. rufopicta</i> F. Smith, 1856 | CAN | – | – | – | – | – | – | – | MB | ON | QC | – | – | – | – | – | MB-GJHC |
| <i>C. sexta</i> Say, 1837 ¹³ | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | – |
| <i>C. sextoides</i> Banks, 1947 ¹⁴ | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |
| <i>C. vanduzeei</i> Banks, 1917 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – |
| <i>C. wyomingensis</i> Scullen, 1965 | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | – |

● ¹ Doubtful records: *C. gnarina* Banks, 1913, AB-Scullen 1965, locality and depository unknown; “sc. Canada”-Ferguson 1984b, misidentification of *C. prominens* (MB: 2 spms., WRME, examined); *C. nebrascensis* H. Smith, 1908: a single male from Elbow, SK (CNC) identified by G.R. Ferguson, not distinguishable with certainty from *C. wyomingensis*. ● ² A critical article that untangles nomenclatural confusion of earlier works. ● ³ AB-Strickland 1947: misidentification of *C. nigrescens*. ● ⁴ BC-Scullen 1965: recorded as *C. acanthophila* auctt., nec Cockerell, 1897; see Ferguson (1983b). ● ⁵ ON: occurrence status uncertain, based on a single specimen from 1934 (Buck 2004). ● ⁶ BC-Blades and Maier 1996: misidentification of *C. californica*; BC-Krombein (1979) (as *C. rufinoda* auctt., nec Cresson, 1865; see Ferguson 1984b); doubtful. ● ⁷ BC-Scullen 1965: doubtful (depository unknown); BC-Kimoto and Buck 2014: misidentification of *C. californica*. ● ⁸ QC-Jobin and Perron 2008. ● ⁹ Nominate subspecies. ● ¹⁰ QC-Finnamore 1982: recorded as *C. melanthæ* auctt., nec Banks, 1947; see Ferguson (1984b). ● ¹¹ AB-Carter 1925: misidentification of *C. deserta*; “se. Canada”-Ferguson 1984b: likely in error; ON-Buck 2004: misidentification of *C. nigrescens*, see Appendix 1: Taxonomy notes. ● ¹² ON-Buck 2004 and Buck et al. 2006: misidentifications, see Appendix 1: Taxonomy notes. ● ¹³ BC-Scullen 1965 (as *C. stigmatialis* auctt., nec Banks, 1916), and subsequently BC-Ratzlaff 2016: misidentification of *C. sextoides*. ● ¹⁴ BC-Scullen 1965: recorded as *C. tepaneca* auctt., nec de Saussure, 1867; see Bohart and Grissell 1975.

Genus *Eucerceris* Cresson, 1865 ¹

| | | | | | | | | | | | | | | | | | | | |
|--|-----|---|---|---|---|----|----|----|----|----|----|---|---|---|---|---|---|---|---------------------------|
| Revision – Scullen 1968. | | | | | | | | | | | | | | | | | | | |
| <i>E. cressoni</i> (Schletterer, 1887) | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | – | SK-RSKM |
| <i>E. flavocincta</i> Cresson, 1865 ² | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | – | MB-MMMN |
| <i>E. montana</i> Cresson, 1882 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>E. superba</i> Cresson, 1865 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | – | |
| <i>E. vittatifrons</i> Cresson, 1879 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | – | SMDV |
| <i>E. zonata</i> (Say, 1823) ³ | CAN | – | – | – | – | – | – | – | MB | ON | QC | – | – | – | – | – | – | – | MB-WRME; QC-iNat 2023g |

● ¹ Excluded species: *E. rubripes* Cresson, 1879, AB-Scullen 1968, misidentification of *C. cressoni* (UASM). ● ² ON-Buck 2004: doubtful, locality uncertain. ● ³ ON: occurrence status unclear, possibly extirpated (see Leclerc et al. in press).

SUBFAMILY PHILANTHINAE LATREILLE, 1802

Genus *Philanthus* Fabricius, 1790

Key to Nearctic species – Bohart and Grissell 1975; key to *P. politus*-group – Ferguson 1983a; key to *P. zebratus*-group – Ferguson 1984a.

| | | | | | | | | | | | | | | | | | | | |
|--|-----|---|----|----|---|----|----|----|----|----|----|----|----|----|---|---|---|---|---------------------------------|
| <i>P. albopilosus</i> Cresson, 1865 | CAN | – | – | – | – | – | AB | SK | MB | ON | – | – | – | – | – | – | – | – | |
| <i>P. bilunatus</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | – | BC-PMAE |
| <i>P. crabroniformis</i> F. Smith, 1856 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | – | |
| <i>P. gibbosus</i> (Fabricius, 1775) | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | – | – | – | – | – | – | SK-RSKM; NB-BugG 2019b |
| <i>P. gloriosus</i> Cresson, 1865 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | – | SK-GJHC |
| <i>P. inversus</i> Patton, 1879 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | – | SK-RSKM |
| <i>P. lepidus</i> Cresson, 1865 | CAN | – | – | – | – | – | – | – | MB | ON | QC | – | – | – | – | – | – | – | QC-RSKM |
| <i>P. multimaculatus</i> Cameron, 1891 | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | – | |
| <i>P. pacificus</i> Cresson, 1880 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | – | |
| <i>P. politus</i> Say, 1824 | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | – | – | – | – | – | – | – | AB-PMAE; QC-LEMQ |
| <i>P. psyche</i> Dunning, 1896 | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | – | – | AB-PMAE; SK-CMNC |
| <i>P. pulcher</i> Dalla Torre, 1897 | CAN | – | YT | NT | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | – | YT-SMDV |
| <i>P. sanbornii</i> Cresson, 1865 | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | – | – | – | – | – | – | – | SK-CMNC; QC-iNat 2022m |
| <i>P. solivagus</i> Say, 1837 | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | NB | – | NS | – | – | – | – | NB-BugG 2014c |
| <i>P. ventilabris</i> Fabricius, 1798 | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | – | – | – | – | – | – | SK-RSKM; QC-LEMQ; NB-iNat 2020h |
| <i>P. ventralis</i> (Mickel, 1918) | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | – | |
| <i>P. zebratus</i> Cresson, 1880 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | – | |
| = <i>P. basilaris</i> Cresson, 1880 ¹ | | | | | | | | | | | | | | | | | | | |

● ¹ Synonymy confirmed, see Appendix 1: Taxonomy notes.

FAMILY PSENIDAE COSTA, 1858

Genus *Mimesa* Shuckard, 1837 ¹

Nearctic revision – Finnamore 1983.

| | | | | | | | | | | | | | | | | | | | |
|---|-----|---|---|---|---|----|----|----|----|----|----|----|---|---|---|---|---|---|------------------|
| <i>M. cheyenne</i> Finnamore, 1983 ² | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | – | BC-SMDV; AB-PMAE |
| <i>M. coquillettii</i> (Rohwer, 1910) | CAN | – | – | – | – | – | – | SK | – | – | – | – | – | – | – | – | – | – | GJHC |
| <i>M. cressonii</i> Packard, 1867 | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | – | – | |
| <i>M. curta</i> Pulawski & Buck, nom. nov. | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | – | |
| = <i>M. simplex</i> (Malloch, 1933) (preocc.) ³ | | | | | | | | | | | | | | | | | | | |
| <i>M. dawsoni</i> Mickel, 1916 | CAN | – | – | – | – | BC | AB | SK | MB | ON | – | – | – | – | – | – | – | – | BC-RBCM; SK-CMNC |
| <i>M. edentata</i> (Malloch, 1933) | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | – | AB-PMAE |
| <i>M. ezra</i> (Pate, 1944) | CAN | – | – | – | – | BC | AB | SK | – | ON | QC | NB | – | – | – | – | – | – | BC-RBCM |

| | | | | | | | | | | | | | | | | | | |
|---|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|---|--|
| <i>A. azteca</i> Cameron, 1888 ² | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF | – | AK-UAM; Menke 2020; NS-RSKM; NF-NOFC |
| <i>A. breviceps</i> F. Smith, 1856 ³ | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | RBCM |
| <i>A. cleopatra</i> Menke, 1964 | CAN | – | – | – | – | BC | AB | SK | – | ON | – | – | – | – | – | – | – | BC-RBCM; SK-RSKM; ON-DEBU |
| <i>A. evansi</i> Menke, 1964 | CAN | – | – | – | – | – | – | – | – | ON | QC | NB | – | NS | – | – | – | |
| <i>A. extremitata</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | |
| <i>A. fernaldi</i> (Murray, 1938) | CAN | – | – | – | – | – | AB | – | MB | ON | QC | NB | – | – | – | – | – | AB-PMAE; ON-WRME; QC-LEMQ; NB-iNat 2022h |
| <i>A. ferruginosa</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | BC-SMDV; SK-RSKM |
| <i>A. harti</i> (Fernald, 1931) | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | NB | – | – | – | – | – | Menke 2020 |
| <i>A. juncea</i> Cresson, 1865 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | RSKM |
| <i>A. karenae</i> Menke, 1964 | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | RBCM; PMAE |
| <i>A. kennedyi</i> (Murray, 1938) | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | |
| <i>A. macra</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | |
| <i>A. mcclayi</i> Menke, 1964 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>A. mediata</i> Cresson, 1865 | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | – | NS | LB | – | – | AK-SMDV; Menke 2020; NS-RSKM |
| <i>A. nigricans</i> Dahlbom, 1843 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | – | DEBU |
| <i>A. pictipennis</i> Walsh, 1869 | CAN | – | – | – | – | – | – | – | – | ON | QC | NB | – | – | – | – | – | QC-iNat 2022i; NB-iNat 2021g |
| <i>A. placida</i> F. Smith, 1856 ⁴ | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – | – | |
| <i>A. polita</i> Cresson, 1865 | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-SMDV; SK-PMAE |
| <i>A. procera</i> Dahlbom, 1843 | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | – | – | – | – | – | SK-RSKM; NB-iNat 2019g |
| <i>A. pruinosa</i> Cresson, 1865 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – | – | PMAE |
| <i>A. regina</i> Menke, 1964 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | |
| <i>A. strenua</i> Cresson, 1865 ⁵ | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | SMDV; PMAE |
| <i>A. urnaria</i> Dahlbom, 1843 ⁶ | CAN | – | – | – | – | – | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | AB-PMAE |
| <i>A. varipes</i> Cresson, 1865 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | SK-PMAE |

● ¹ Excluded species: *A. acuta* (Fernald, 1934), BC-Ratzlaff (2016), misidentifications of *A. regina* and *A. extremitata*; *A. panapolita* (Fernald, 1934), AB-Strickland 1947, misidentifications of *A. ferruginosa* and *A. macra*; *A. parkeri* Menke, 1964, AB-Finnamore and Buckle 1999, misidentification of *A. varipes*. ● ² Nominate subspecies. ● ³ AB-Strickland 1947: misidentification of *A. varipes*. ● ⁴ BC-Spencer and Wellington 1948 (cited in Ratzlaff 2016): misidentification of *A. extremitata*. ● ⁵ NT-Steiner 1973: misidentification of *A. mediata*. ● ⁶ AB-Strickland 1947: misidentifications of *A. azteca* and *A. kennedyi*.

Genus *Eremnophila* Menke, 1964

Key to species – Menke 1964.

| | | | | | | | | | | | | | | | | | | |
|---------------------------------------|-----|---|---|---|---|---|---|---|---|----|----|----|----|----|---|---|---|---|
| <i>E. aureonotata</i> (Cameron, 1888) | CAN | – | – | – | – | – | – | – | – | ON | QC | NB | PE | NS | – | – | – | NB-iNat 2019i; PE-iNat 2019j; NS-iNat 2023h |
|---------------------------------------|-----|---|---|---|---|---|---|---|---|----|----|----|----|----|---|---|---|---|

Genus *Podalonia* Fernald, 1927¹

North and Central American revision – Murray 1940.

| | | | | | | | | | | | | | | | | | | |
|--|-----|----|----|----|---|----|----|----|----|----|----|----|----|----|---|---|---|------------|
| <i>P. argentifrons</i> (Cresson, 1865) | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | BC-RBCM |
| <i>P. atriceps</i> (F. Smith, 1856) | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | SK-PMAE |
| <i>P. chypeata</i> Murray, 1940 | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – | – | SMDV; PMAE |
| <i>P. luctuosa</i> (F. Smith, 1856) | CAN | – | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | |
| <i>P. melaena</i> Murray, 1940 | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | – | SMDV |
| <i>P. mexicana</i> (Saussure, 1867) | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | |
| <i>P. mickeli</i> Murray, 1940 | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | |
| <i>P. occidentalis</i> Murray, 1940 ² | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – | – | SK-CMNC |
| <i>P. robusta</i> (Cresson, 1865) | CAN | AK | YT | NT | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | – | AK-UAM |
| <i>P. sericea</i> Murray, 1940 | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | |
| <i>P. sonorensis</i> (Cameron, 1888) | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – | – | BC-RBCM |
| <i>P. valida</i> (Cresson, 1865) | CAN | – | – | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – | – | MB-RSKM |
| <i>P. violaceipennis</i> (Lepeletier, 1845) ³ | CAN | – | – | – | – | – | – | SK | MB | ON | QC | – | – | – | – | – | – | QC-LEMQ |

● ¹ Excluded species: *P. argentipilis* (Provancher, 1887), a nomen dubium, described from BC, see Ratzlaff (2016). ● ² BC-Ratzlaff 2016: misidentifications of *P. robusta* and *P. sericea*. ● ³ AB-Carter 1925, AB-Strickland 1947: misidentifications of *P. luctuosa*, *P. robusta* and *P. sericea*; AB-Hilchie 1982: misidentification of *P. sericea*; AB-Finnamore and Buckle 1999: misidentification of *P. mickeli*.

SUBFAMILY CHLORIONTINAE FERNALD, 1905

Genus *Chlorion* Latreille, 1802

Nearctic revision – Bohart and Menke 1963 (as part of “Sceliphronini”).

C. aerarium Patton, 1879 CAN – – – – BC **AB** – – ON – – – – – – BC-SMDV; AB-PMAE

SUBFAMILY SCELIPHRINAE ASHMEAD, 1899

Nearctic revision – Bohart and Menke 1963 (as “Sceliphronini”).

TRIBE PODIINI DE SAUSSURE, 1892

Genus *Podium* Fabricius, 1804

P. luctuosum F. Smith, 1856 CAN – – – – – – – – ON – – – – – – DEBU

TRIBE SCELIPHRINI ASHMEAD, 1899

Genus *Chalybion* Dahlbom, 1843

C. californicum (de Saussure, 1867) CAN – – – – BC AB **SK MB** ON QC NB **PE** NS – – – SK-GJHC; MB-WRME; PE-BugG 2008; NS-BugG 2014d

Genus *Sceliphron* Klug, 1801

S. caementarium (Drury, 1773) CAN – – – – BC AB **SK MB** ON QC NB PE NS – – – SK-RSKM

S. curvatum (F. Smith, 1870) ^{§1} **CAN** – – – – – – – – **ON QC** – – **NS** – – – DEBU; BugG 2013e; iNat 2022j

● ¹ NS: occurrence status uncertain, based on a single record.

SUBFAMILY SPHECINAE LATREILLE, 1802

Nearctic revision – Bohart and Menke 1963 (as Sphecini).

TRIBE PRIONYCHINI R. BOHART & MENKE, 1963

Genus *Palmodes* Kohl, 1890 ¹

P. californicus R. Bohart & Menke, 1961 **CAN** – – – – **BC** – – – – – – – – – Bohart and Menke 1963

P. carbo R. Bohart & Menke, 1963 CAN – – – – BC **AB SK** – – – – – – – – – AB,SK-PMAE

P. dimidiatus (DeGeer, 1773) CAN – – – – – – – **MB** ON – – – – – – iNat 2024f; DEBU

P. hesperus R. Bohart & Menke, 1961 CAN – – – – BC – – – – – – – – – –

● ¹ Excluded species: *P. laeiventris* (Cresson, 1865), BC-Spencer and Wellington 1948 (cited by Ratzlaff 2016), misidentification of *P. carbo*.

Genus *Prionyx* Van der Linden, 1827 ¹

P. atratus (Lepelletier, 1845) CAN – – – – BC AB SK **MB** ON QC – – – – – – MB-RSKM

P. canadensis (Provancher, 1887) ² CAN – – – – BC AB SK MB – – – – – – – – –

P. parkeri R. Bohart & Menke, 1963 ³ CAN – – – – – – – – ON **QC NB** – – – – – – DEBU; iNat 2020i; BugG 2013f

P. thomae (Fabricius, 1775) CAN – – – – – AB **SK** – – – – – – – – – PMAE; RSKM

● ¹ Excluded species: *P. bifoveolatus* (Taschenberg, 1869), BC-Spencer and Wellington 1948, AB-Carter 1925, ON-Harrington 1902, misidentifications of *P. canadensis*, *P. parkeri* and *P. thomae*. ● ² ON-Bohart and Menke 1963: probable misidentifications (depository unknown). See Appendix 1: Taxonomy notes. ● ³ AB-Finnamore and Buckle 1999: misidentification of *P. canadensis*.

TRIBE SPHECINI LATREILLE, 1802

Genus *Isodontia* Patton, 1880

Subgenus *Isodontia* Patton, 1880

I. apicalis (F. Smith, 1856) CAN – – – – – – – – ON – – – – – – –

I. philadelphia (Lepelletier, 1845) CAN – – – – – – – – ON – – – – – – – DEBU

Subgenus *Murrayella* R. Bohart & Menke, 1963 ¹

I. auripes (Fernald, 1906) CAN – – – – – – – – ON – – – – – – –

I. elegans (F. Smith, 1856) ² CAN – – – – BC **AB SK** – ON – – – – – – – SK-RSKM; ON-DEBU

I. mexicana (de Saussure, 1867) ³ CAN – – – – **BC** – – – ON QC **NB PE NS** – – – – BC-PMAE; NB-iNat 2020j; PE-iNat 2023i; NS-iNat 2021i

● ¹ Excluded species: *I. azteca* (de Saussure, 1867) (as *Chlorion aztecum*), BC-Spencer and Wellington 1948, misidentification of *Sphex lucae*.

● ² Native to western Nearctic, introduced in ON. ● ³ BC populations possibly due to accidental introduction(s), see Results and discussion: Introduced species.

Genus *Sphex* Linnaeus, 1758

Subgenus *Fernaldina* R. Bohart & Menke, 1963

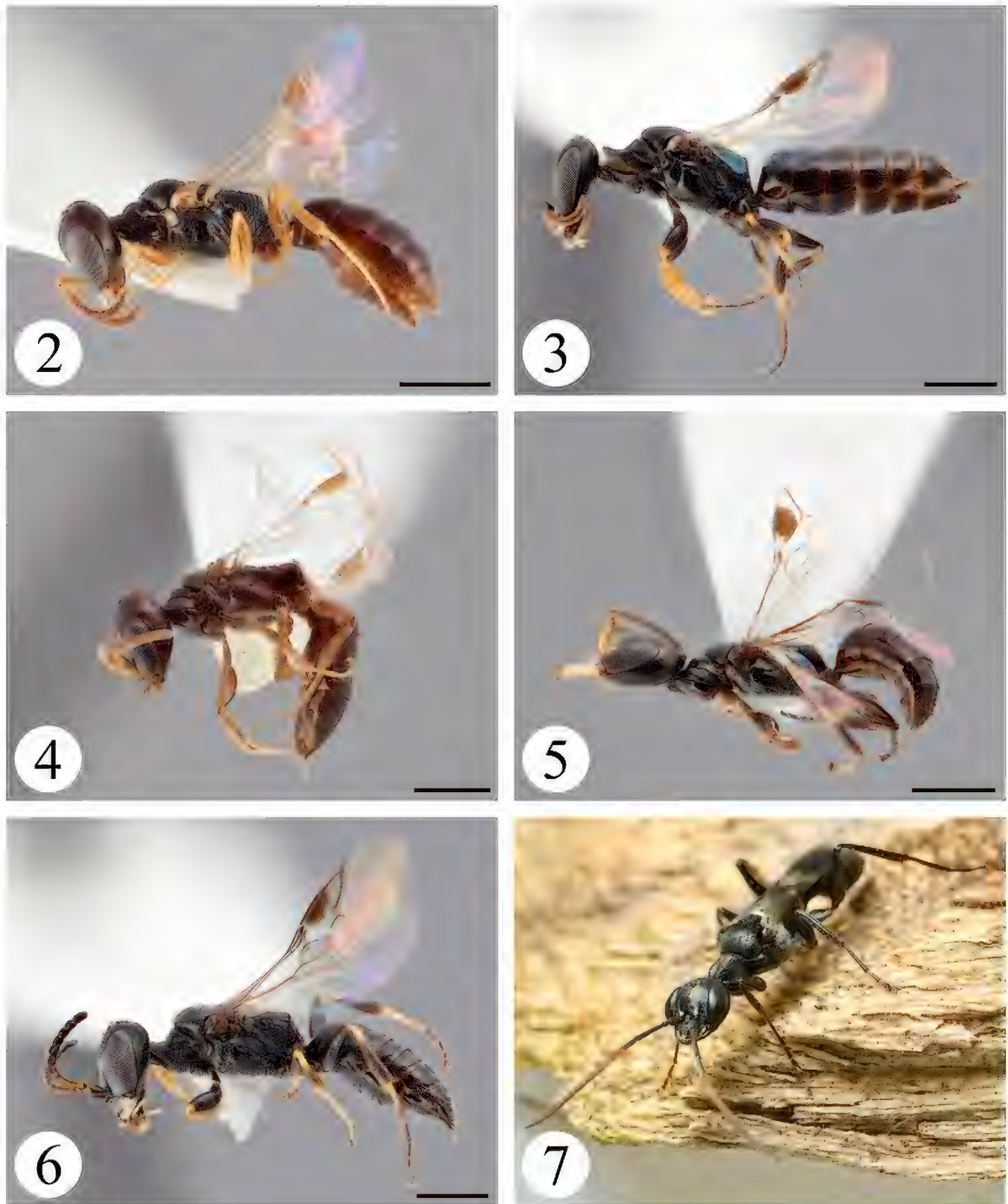
S. lucae de Saussure, 1867 CAN – – – – BC **AB SK** – – – – – – – – – AB-PMAE; SK-GJHC

Subgenus *Sphex* Linnaeus, 1758

S. ichneumoneus (Linnaeus, 1758) CAN – – – – BC AB **SK MB** ON QC NB – – – – – – MB-iNat 2017

S. pensylvanicus Linnaeus, 1763 ¹ CAN – – – – – – – – ON QC NB – – – – – – QC-LEMQ; NB-NBMB

● ¹ MB-Bizecki Robson 2014: misidentification of *Podalonia argentifrons*.



Figures 2–7. Ammoplanidae and Ampulicidae adults. **2–6** Ammoplanidae. **7** Ampulicidae (Ampulicinae). **2** *Ammoplanellus umatilla*, female, Writing-on-Stone Provincial Park, AB (© Matthias Buck, PMAE) **3** *Ammoplanops moenkopi*, female, Onefour, AB (© Matthias Buck, PMAE) **4** *Ammoplanus unami*, female, Parc de la Gatineau, QC (© Matthias Buck, PMAE) **5** *Parammoplanus irwini*, male, Milk River near Ross Lake Natural Area, AB (© Matthias Buck, PMAE) **6** *Pulverro columbianus*, male, Redcliff, AB (© Matthias Buck, PMAE) **7** *Ampulex canaliculata*, male, Rondeau Provincial Park, ON (© Steve Marshall). Scale bars: 0.5 mm.



Figures 8–13. Ampulicidae, Astatidae and Bembicidae adults. **8** Ampulicidae (Dolichurinae). **9–11** Astatidae. **12–13** Bembicidae (Alyssontinae). **8** *Dolichurus greenei*, female, Pinery Provincial Park, ON (© Steve Marshall) **9** *Astatata unicolor*, female, Fundy National Park, NB (© Denis Doucet) **10** *Diploplectron peglowi*, male, St. Williams, ON (© Steve Marshall) **11** *Dryudella caerulea*, male, Comox, BC (© Carroll Perkins) **12** *Alysson melleus*, female, Parry Sound, ON (© Steve Marshall) **13** *Didineis texana*, male, Toronto, ON (© Owen Strickland).



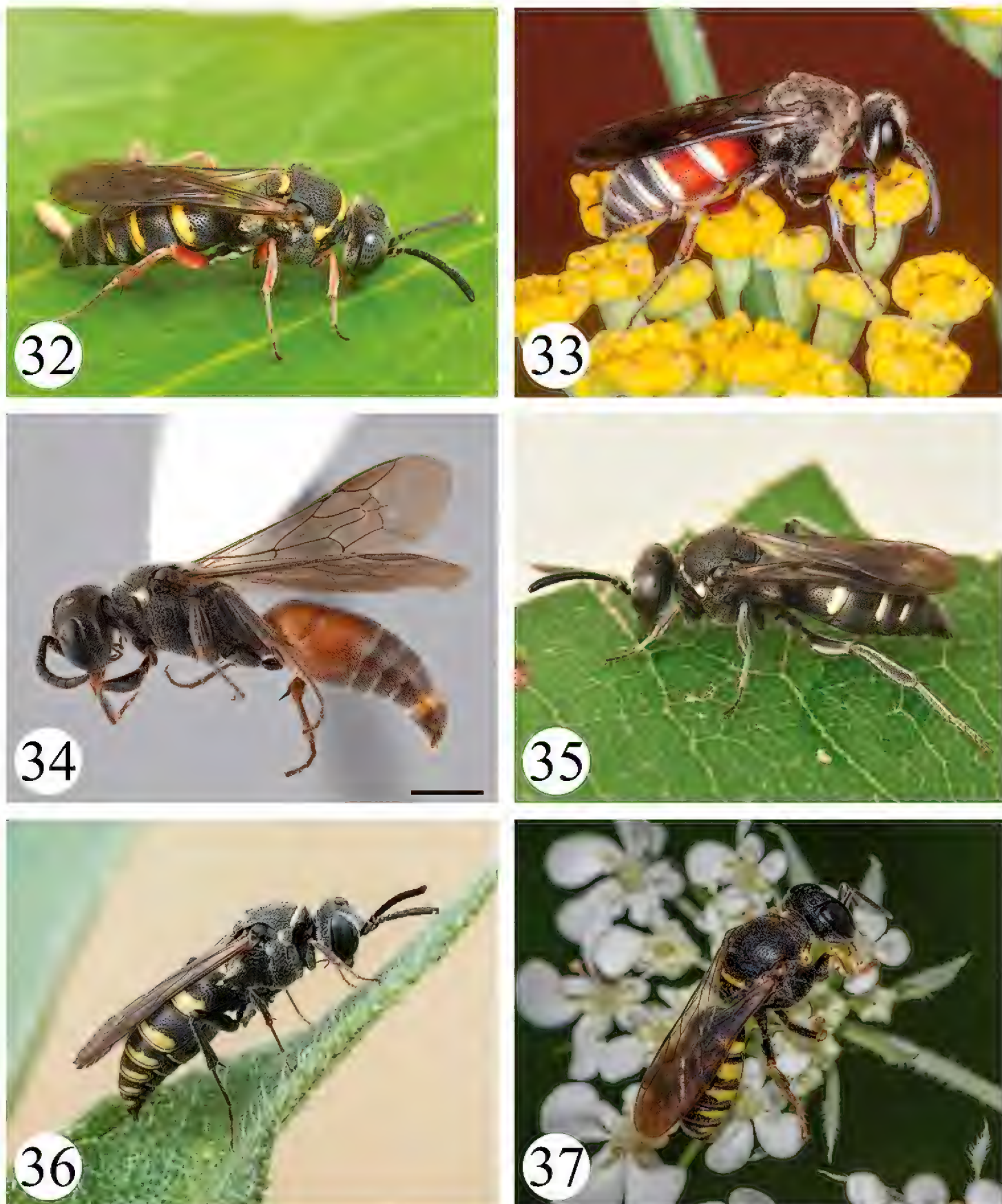
Figures 14–19. Bembicidae (Bembicinae) adults. **14** *Bembix pallidipicta*, female, Norfolk County, ON (© Riley Walsh) **15** *Bicyrtes quadrifasciatus*, female, Pinery Provincial Park, ON (© Steve Marshall) **16** *Microbembex monodonta*, female, Spruce Woods Provincial Park, MB (© Deanna Dodgson) **17** *Stictia carolina*, female, Cape May Point, New Jersey (© Stephen Mirick) **18** *Argogorytes nigrifrons*, female, Apohaqui, NB (© Denis Doucet) **19** *Clitemnestra bipunctata*, male, Edmonton, AB (© Carroll Perkins).



Figures 20–25. Bembicidae (Bembicinae) adults. **20** *Gorytes simillimus*, female, Clyde, AB (© Carroll Perkins) **21** *Harpactus* sp., male, San Bernardino County, California (© Elena Oey) **22** *Hoplisoides nebulosus* or *punctifrons*, male, near Rolling Hills, AB (© Terry Thormin) **23** *Lestiphorus cockerelli*, female, Groton, Massachusetts (© Tom Murray) **24** *Oryttus gracilis*, male, near Rolling Hills, AB (© Terry Thormin) **25** *Psammaletes mexicanus*, female, Gateway National Recreation Area, New York (© Julian Fuchs).



Figures 26–31. Bembicidae (Bembicinae) adults. **26** *Saygorytes phaleratus*, male, Brampton, ON (© Bob Noble) **27** *Sphecius speciosus*, female, Walpole Island, ON (© Steve Marshall) **28** *Glenostictia pictifrons*, female, Calhan, Colorado (© Eric Eaton) **29** *Steniolia scolopacea*, female, Lillooet, BC (© Ian Routley) **30** *Stictiella emarginata*, female, Toronto, ON (© Dave Beadle) **31** *Stizoides renicinctus*, female, Kennewick, Washington (© Donna Lucas).



Figures 32–37. Bembicidae and Crabronidae adults. **32–36** Bembicidae (Nyssoninae). **37** Crabronidae (Crabroninae). **32** *Epinysson mellipes*, male, Ojibway Prairie Provincial Nature Reserve, ON (© Steve Marshall) **33** *Foxia cf. pacifica*, female, Mariposa County, California (© Daniel Horner) **34** *Hyponysson bicolor*, male, Sunnynook, AB (© Matthias Buck, PMAE) **35** *Nysson lateralis*, female, Ojibway Prairie Provincial Nature Reserve, ON (© Steve Marshall) **36** *Zanysson texanus*, male, Franklin County, Washington (© Lisa Hill) **37** *Anacrabro ocellatus*, female, Peel Region, ON (© Bob Noble). Scale bar: 1 mm.



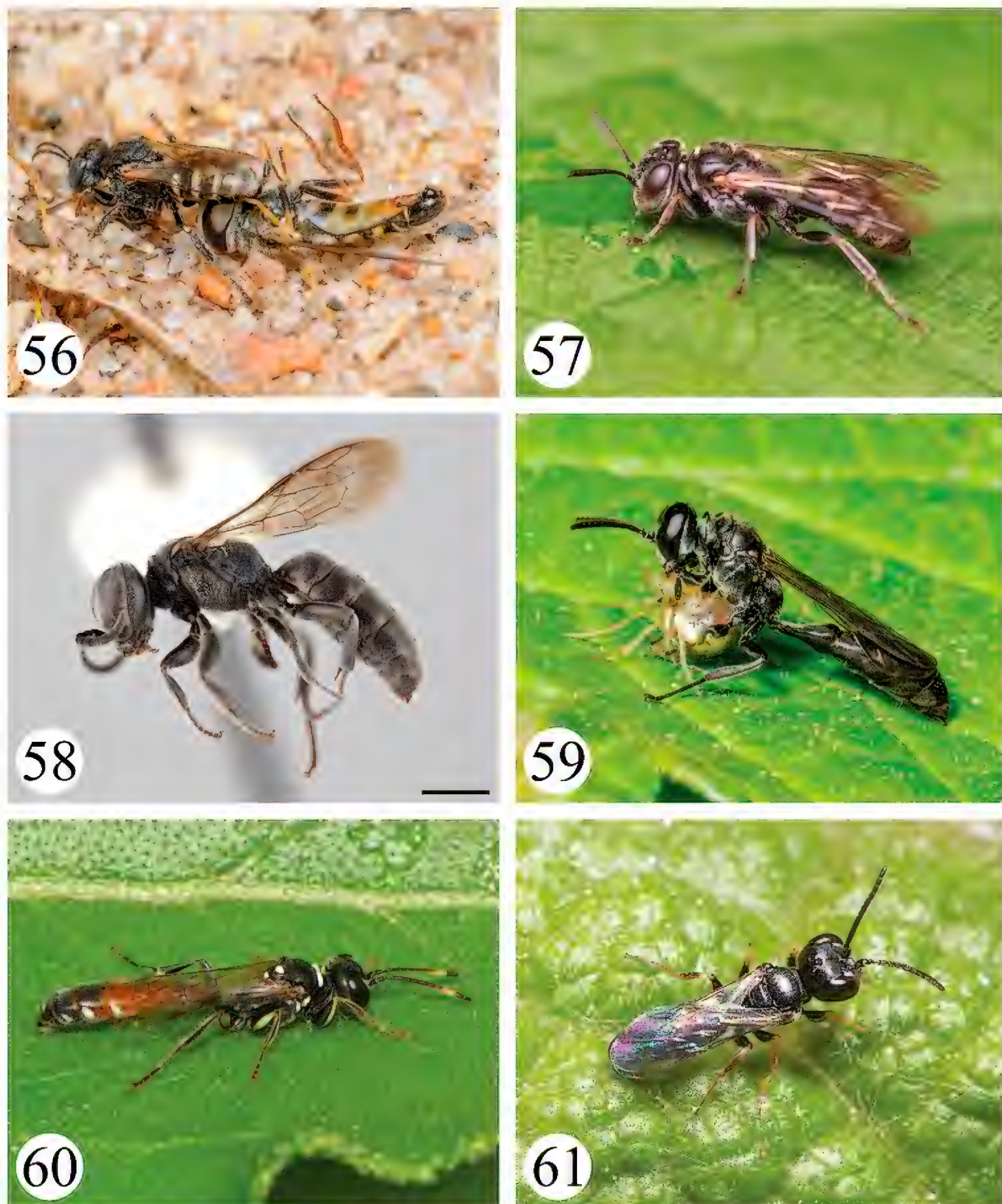
Figures 38–43. Crabronidae (Crabroninae) adults. **38** *Entomognathus memorialis*, female, Orono, Minnesota (© Heather Holm) **39** *Crabro argusinus*, male, Clyde, AB (© Carroll Perkins) **40** *Crossocherus impressifrons*, female, Sussex Corner, NB (© Denis Doucet) **41** *Ectemnius lapidarius*, female, Elk Island National Park, AB (© Carroll Perkins) **42** *Lestica confluenta*, male guarding female, Edmonton, AB (© Carroll Perkins) **43** *Lindenius errans* or *armaticeps*, female, Knoxville, Tennessee (© Will Kuhn).



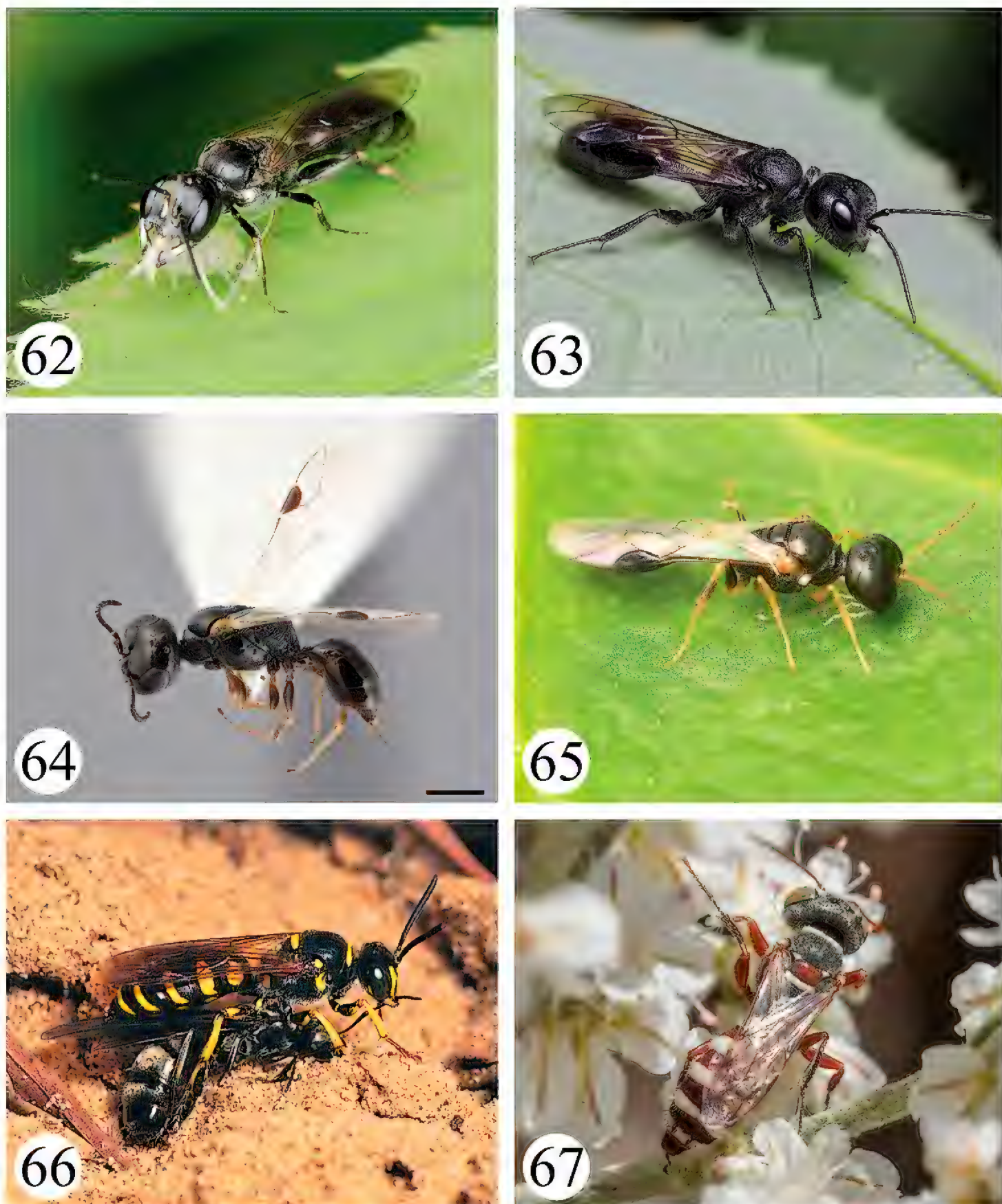
Figures 44–49. Crabronidae adults. **44** Crabroninae. **45–49** Larrinae. **44** *Rhopalum clavipes*, female, Québec, QC (© Léo-Guy de Repentigny) **45** *Larropsis distincta*, Pinery Provincial Park, ON (© Steve Marshall) **46** *Tachysphex similis*, female, Opal, AB (© Carroll Perkins) **47** *Tachytes harpax*, female, Fundy National Park, NB (© Denis Doucet) **48** *Larra analis*, female, Hanover County, Virginia (© Louise Woodrich) **49** *Liris argentatus*, male, St. Williams, Manestar Tract, ON (© Steve Marshall).



Figures 50–55. Crabronidae adults. **50–54** Miscophinae. **55** Oxybelinae. **50** *Lyroda subita*, female, near Rolling Hills, AB (© Terry Thormin) **51** *Miscophus californicus*, female, Santa Barbara County, California (© Alice Abela, species identification see Kurczewski et al. 2020) **52** *Nitela* sp., female, San Diego, California (© Steve Kerr) **53** *Plenoculus davisii*, female, Ganaraska forest, Clarington, ON (© Steve Marshall) **54** *Solierella inermis*-group, male, Vail, Arizona (© Jillian Cowles) **55** *Belomicrus forbesii*, male, Ukalta, AB (© Matthias Buck, PMAE). Scale bar: 1 mm.



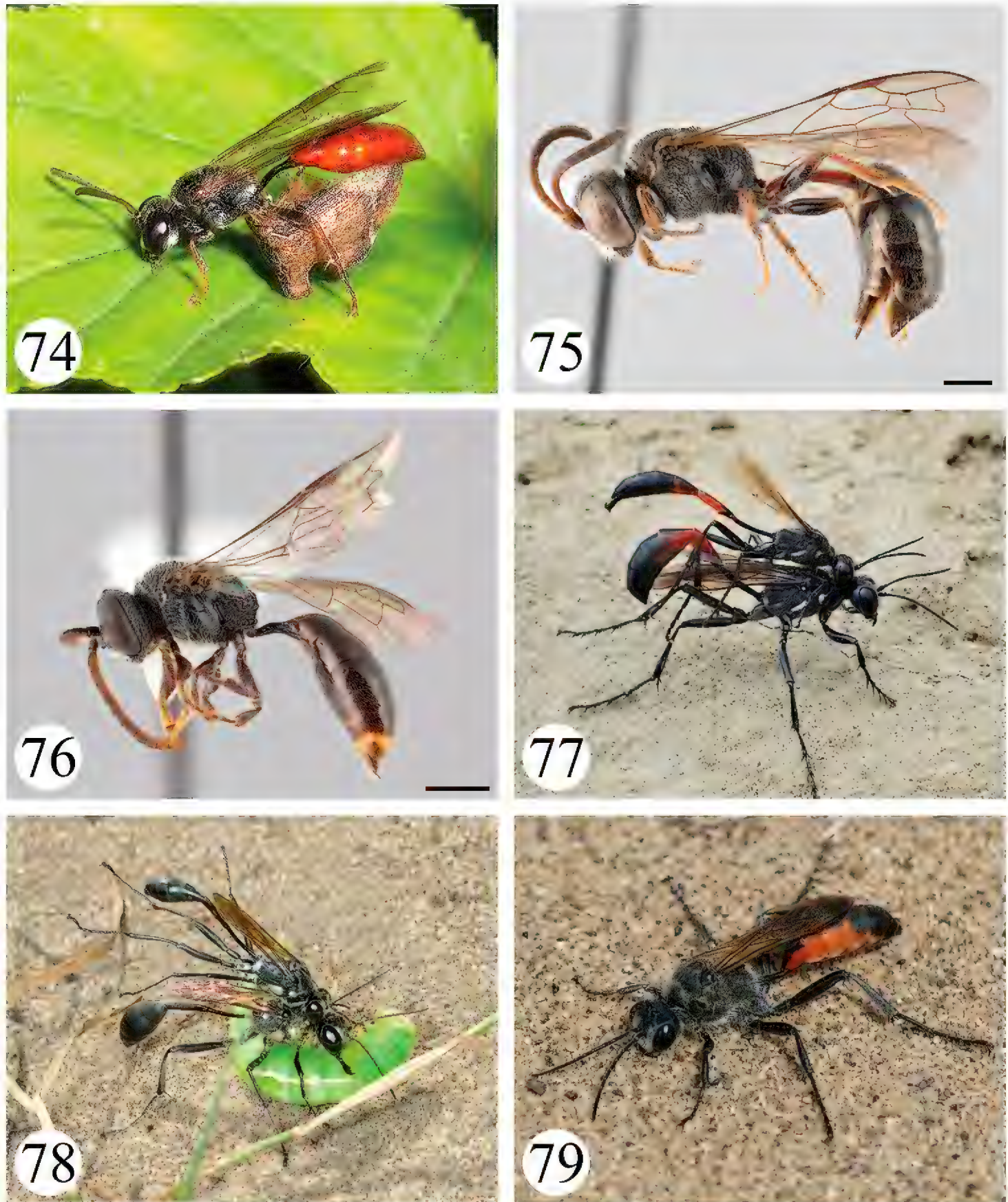
Figures 56–61. Crabronidae, Mellinidae and Pemphredonidae adults. **56–59** Crabronidae. **60** Mellinidae. **61** Pemphredonidae. **56** *Oxybelus uniglumis*, female (Oxybelinae), Elk Island National Park, AB (© Carroll Perkins) **57** *Pison koreense* (Trypoxylinae), West Harrison, New York (© Clarence Holmes) **58** *Pisonopsis triangularis*, male (Trypoxylinae), Onefour, AB (© Matthias Buck, PMAE) **59** *Trypoxylon frigidum*, female (Trypoxylinae), Edmonton, AB (© Carroll Perkins) **60** *Mellinus abdominalis*, male, near Rolling Hills, AB (© Terry Thormin) **61** *Diodontus minutus*, male (Pemphredoninae), Fergus, ON (© Steve Marshall). Scale bar: 1 mm.



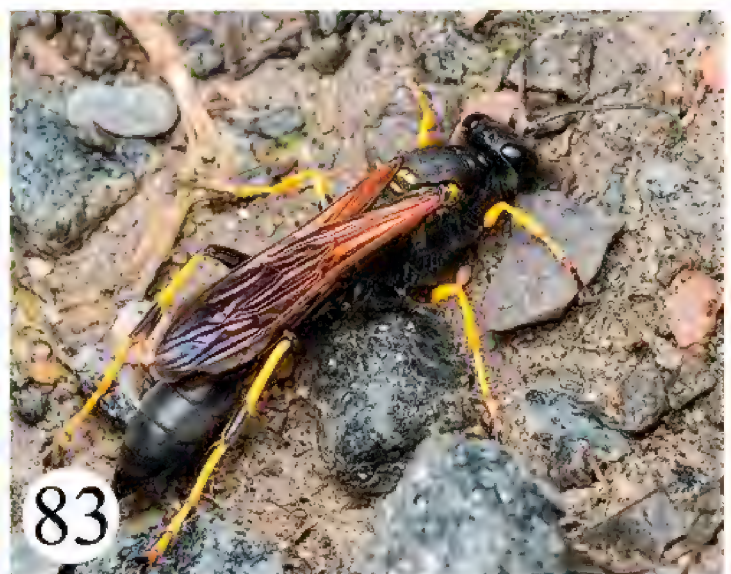
Figures 62–67. Pemphredonidae and Philanthidae adults. **62–65** Pemphredonidae. **66–67** Philanthidae (Aphilanthopinae). **62** *Passaloecus cuspidatus*, female (Pemphredoninae), Edmonton, AB (© Carroll Perkins) **63** *Pemphredon* sp., female (Pemphredoninae), Québec, QC (© Léo-Guy de Repentigny) **64** *Spilomena occidentalis*, female (Spilomeninae), Edmonton, AB (© Matthias Buck, PMAE) **65** *Stigmus americanus*-complex, male (Stigminae), Ojibway Prairie Provincial Nature Reserve, ON (© Steve Marshall) **66** *Aphilanthops frigidus*, female, St. Williams, ON (© Steve Marshall) **67** *Clypeadon laticinctus*, female, Richland, Washington (© Lisa Hill). Scale bar: 0.5 mm.



Figures 68–73. Philanthidae and Psenidae adults. **68–70** Philanthidae. **71–73** Psenidae. **68** *Cerceris sexta*, female (Cercerinae), Twin River Heritage Rangeland Natural Area, AB (© Matthias Buck) **69** *Eucerceris zonata*, female (Cercerinae), near Spruce Woods Provincial Park, MB (© Deanna Dodgson) **70** *Philanthus psyche*, male (Philanthinae), near Rolling Hills, AB (© Terry Thormin) **71** *Mimesa* sp., male, Cedar Creek Conservation Area, ON (© Steve Marshall) **72** *Mimumesa* sp., male, Brampton, ON (© Bob Noble) **73** *Pluto* sp. (undescribed), male, Onefour, AB (© Matthias Buck, PMAE). Scale bar: 1 mm.



Figures 74–79. Psenidae and Sphecidae adults. **74–76** Psenidae. **77–79** Sphecidae (Ammophilinae). **74** *Psen monticola*, female, Elora, ON (© Steve Marshall) **75** *Pseneo longiventris kohlii*, female, Williamsville, Missouri (© Matthias Buck, PMAE) **76** *Psenulus pallipes parenosus*, male, Ancaster, ON (© Matthias Buck, PMAE) **77** *Ammophila macra*, male guarding female, near Writing-on-Stone, AB (© Matthias Buck) **78** *Eremnophila aureonotata*, male guarding female, Ojibway Prairie Provincial Nature Reserve, ON (© Steve Marshall) **79** *Podalonia valida*, male, near Rolling Hills, AB (© Terry Thormin). Scale bars: 1 mm.



Figures 80–85. Sphecidae adults. **80** Chloriontinae. **81–83** Sceliphrinae. **84–85** Sphecinae. **80** *Chlorion aerarium*, female, Pinery Provincial Park, ON (© Steve Marshall) **81** *Podium luctuosum*, female, Pinery Provincial Park, ON (© Michael King) **82** *Chalybion californicum*, female, Québec, QC (© Léo-Guy de Repentigny) **83** *Sceliphron caementarium*, female, Québec, QC (© Léo-Guy de Repentigny) **84** *Palmodes dimidiatus*, female, Hanover County, Virginia (© Louise Woodrich) **85** *Prionyx parkeri*, female, Fundy National Park, NB (© Denis Doucet).



Figures 86–90. Adults, nests and environments of apoid wasps. **86–87** Adults of Sphecidae (Sphecinae). **88–89** Nests. **90.** Environments. **86** *Isodontia mexicana*, female, Fundy National Park, NB (© Denis Doucet) **87** *Sphex pensylvanicus*, female, Québec, QC (© Léo-Guy de Repentigny) **88** *Trypoxylon politum* nest with female (Crabronidae, Trypoxylinae), Guelph, ON (© Steve Marshall) **89** *Sceliphron caementarium* nest with female (Sphecidae, Sceliphrinae), Elora, ON (© Steve Marshall) **90** Milk River Natural Area in southeastern Alberta. The Milk River Valley is one of the apoid wasp biodiversity hotspots in the area of the checklist. Alberta has 326 described species of apoid wasps, more than any other province or territory in Canada (© Matthias Buck).

Results by political regions

Table 1 summarizes the results by administrative region and family. The total number of provincial/territorial/Alaskan species records is 2109. The greatest number of species occurs in Alberta (326), followed by Ontario and British Columbia with nearly identical numbers (294 and 292, respectively). Diversity at the genus level ranks the political regions differently (see Table 1): the largest number of genera occurs in Ontario (71), followed by Alberta/British Columbia (both 64) and Quebec (59). Twenty-four genera occur in Alaska.

The number of new provincial/territorial/Alaskan records (705, shown in red in Table 2) represents one-third (33.4%) of all records in this checklist. Roughly half of the new records emerged from the three Prairie provinces: 124 for Alberta, 117 for Saskatchewan and 113 for Manitoba (Table 1). British Columbia, Ontario, Quebec and the Yukon have proportionally few new records because they have been the subject of previous provincial/territorial checklists. Almost half (49%) of Alaskan records are new. Among the highest percentages of new records (40–64%) were found in the Atlantic provinces for which the apoid wasp fauna had previously been poorly documented. All three Nunavut records are new, showing the lack of previous research in the region. Many more species should occur in the warmer, southern parts of the territory (e.g., Akimiski Island), which remain completely unexplored for apoid wasps.

Undescribed species

In addition to the 531 described species, we are aware of at least 20 undescribed species in Canada, one of which extends into Alaska (see Table 3). Besides that, there is one unidentified species in the genus *Foxia* that may or may not be undescribed (also included in Table 3). Most of the undescribed species are from western Canada, one is transcontinental in the north, and only one appears to be eastern. Alberta has by far the highest number of undescribed species (17 of 20). Almost half of the undescribed species belong to the genus *Diodontus* (Pemphredonidae) whose taxonomy has been in a state of confusion (see Appendix 1: Taxonomy notes). Three of the undescribed species have previously been mentioned in the literature (see Notes under Table 3).

Erroneous previous records

A total of 33 previously published Canadian, 112 provincial/territorial and two Alaskan records were excluded because of misidentifications or because the records appear doubtful (see notes under the respective genus or subgenus in Table 2). Corrected identifications are provided if vouchers were available for re-examination. The greatest number of erroneous records was found for Alberta (38), British Columbia (36) and the Yukon (15). The high number for Alberta is not surprising since the previous provincial checklist was published over 75 years ago (Strickland 1947).

Table 3. Undescribed species of apoid wasps in Canada and Alaska by region. See Methods for explanation of acronyms and Fig. 1 for their locations.

| FAMILY | Genus (Subgenus) | Species | CAN | AK | YT | NT | NU | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF |
|----------------|--|----------------------------|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Bembicidae | <i>Foxia</i> ¹ | | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – |
| Bembicidae | <i>Nysson</i> ² | sp. A | CAN | – | – | – | – | BC | AB | – | – | – | – | – | – | – | – | – |
| Bembicidae | <i>Nysson</i> | sp. nr. <i>hesperus</i> | CAN | – | – | – | – | – | AB | – | MB | ON | – | NB | – | – | – | – |
| Crabronidae | <i>Crabro</i> | | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – |
| Crabronidae | <i>Tachysphex</i> | | CAN | – | – | – | – | – | AB | – | MB | – | – | – | – | – | – | – |
| Crabronidae | <i>Miscophus</i> (<i>Nitelopterus</i>) ³ | | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – |
| Crabronidae | <i>Solierella</i> | | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. 1 | CAN | – | – | – | – | – | AB | SK | MB | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. 3 | CAN | – | YT | – | – | – | AB | SK | MB | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. 4 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. 5 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. 6 | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. 7 | CAN | – | YT | – | – | BC | AB | SK | MB | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> ⁴ | sp. 8 | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. B | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. MA | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – |
| Pemphredonidae | <i>Diodontus</i> | sp. MB | CAN | – | – | – | – | BC | AB | SK | – | – | – | – | – | – | – | – |
| Psenidae | <i>Mimesa</i> | sp. 3 | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – |
| Psenidae | <i>Mimesa</i> | sp. nr. <i>cheyenne</i> | CAN | – | – | – | – | – | AB | SK | – | – | – | – | – | – | – | – |
| Psenidae | <i>Mimumesa</i> ⁵ | | CAN | AK | – | – | – | BC | AB | – | – | ON | QC | NB | – | – | LB | NF |
| Psenidae | <i>Pluto</i> | | CAN | – | – | – | – | – | AB | – | – | – | – | – | – | – | – | – |
| TOTAL | | | 21 | 1 | 2 | 0 | 0 | 7 | 17 | 8 | 6 | 3 | 1 | 2 | 0 | 0 | 1 | 1 |

● ¹ Species unidentified, possibly undescribed (iNaturalist 2020b). ● ² = “*Nysson* sp.” of Ratzlaff (2016). ● ³ = “*Miscophus* sp.” of Ratzlaff (2016). ● ⁴ = “*Diodontus flavitarsis*” (females only) sensu Eighme (1989), nec Fox, 1892, of Buck (2004) (mis-identification). ● ⁵ = “*Mimumesa columbiana*” of Gittins (1963), a nomen nudum; “*Mimumesa* sp. n. A” of Buck (2004).

Taxonomic composition

By far the most speciose family is the Crabronidae, which includes 37.5% of all species in the area of the checklist. The second largest family is Bembicidae (16.6%), followed by Sphecidae (11.3%), Philanthidae (10.9%) and Pemphredonidae (10.2%). Under its former definition (including Psenidae and Ammoplanidae), the latter would have been the second largest family with 18.8% of the total. The highest number of new Canadian records were found in Crabronidae (29 spp.), Pemphredonidae (10 spp.) and Bembicidae (9 spp.). The highest percentages of new Canadian records in relation to the family species totals were found in Ammoplanidae (38%), Psenidae (21%), Pemphredonidae (19%) and Astatidae (18%). This probably has to do with the fact that these families include mostly small, easily overlooked species that are difficult to identify.

The different political areas show characteristic deviations in their species compositions: Crabronidae and Pemphredonidae are overrepresented in Alaska, the Canadian Territories and Newfoundland, probably because they include many species that are adapted to colder climates. Bembicidae reach their highest percentages of the total fauna in the prairie provinces and British Columbia. All Bembicidae are ground nesters, and most species prefer warmer climates, which makes the largely treeless prairie ecozone and the dry interior of British Columbia especially suitable for them.

The five most speciose genera in the area of the checklist are *Cerceris* Latreille (32 spp.), *Tachysphex* Kohl (31 spp.), *Crabro* (28 spp.), *Crossocerus* (26 spp.) and *Ammophila* Kirby (25 spp.). Together, their species make up over one-quarter (26.8%) of the total fauna. If undescribed species were considered, *Diodontus* would closely follow the top five genera with 24 species. *Cerceris* is not only the most speciose genus in Canada and Alaska but also worldwide (877 described species, see Pulawski 2025). Of the remaining genera, 15 have 10–20 species, 40 genera include 2–9 species and 24 genera are represented by a single species in Canada and Alaska.

Endemism

Previously, *Crabro canningsi* Finnamore was considered the only species of apoid wasp endemic to Canada and Alaska (Finnamore 1988; Danks et al. 1997). The species is here synonymized with the widespread Palearctic *C. maeklini* Morawitz (see Appendix 1: Taxonomy notes). It was originally described from the Yukon, with new records from Alaska, the Northwest Territories and Nunavut (see Table 2).

Here, we newly recognize *C. dietrichi* as the only species endemic to the area of the checklist (restricted to Prince Edward Island, Canada). Its endemic status was previously overlooked due to identification errors in the original description. Bohart (1976) cited the type locality as “Prince Edward Island National Park, Ontario, Canada”, and designated additional paratypes from Manitoba, Saskatchewan and Wyoming. The type locality is in fact in the Province of Prince Edward Island, despite the namesake island in Ontario (see discussion in Buck 2004). The paratypes from Manitoba and Saskatchewan are actually misidentified *C. denningi* R. Bohart, a very similar and closely related species (see Appendix 1). We have not seen the paratype from Wyoming, but it is almost certainly misidentified as well. This leaves Prince Edward Island National Park as the only locality from which the species is currently known. With a surface area of 27 km² it is the fourth smallest of Canada’s 37 National Parks (Wikipedia 2024). Due to our fragmentary knowledge of the Canadian Maritime fauna, it is possible that the species will be discovered on other coastal dunes in New Brunswick and perhaps Nova Scotia or Quebec. *Crabro dietrichi* appears to have one of the smallest ranges of any apoid wasp in the Nearctic region. Its sister species, *C. denningi*, which inhabits dune systems from Manitoba to Alberta, is likely the species with the second smallest range among the species that occur in the area of the checklist. The main part of its range appears to lie in Canada, but it has also been recorded from one locality in North Dakota (Bohart 1976).

Canada and Alaska have relatively few endemic insect species compared to other areas of North America, mainly due to their cold climate and extensive glaciation during the Pleistocene. Nonetheless, for the Yukon, Danks et al. (1997) estimated the share of insect species that is restricted to northern unglaciated areas of North America (in both Yukon and Alaska) at about one tenth of the territorial fauna. The number of east Beringian endemics was estimated at 56 in Coleoptera, 18 in Lepidoptera, five in Trichoptera, two in Heteroptera and one each in Hymenoptera, Plecoptera and Orthoptera (Haberski et al. 2021). However, the new synonymy of *Crabro kanningsi* with the Palearctic *C. maeklini* (see above) has removed the only supposed east Beringian Hymenoptera endemic from that list. The scarcity of endemics among apoid wasps is not surprising considering that most of them are good fliers which disperse easily to new suitable habitats (see also under Faunal change, below). Flightless insects, on the other hand, include much higher numbers of endemics. For example, all fifteen species of Protura that are known from Alaska have never been found outside the state and are likely eastern Beringian endemics (Sikes and Allen 2016).

Species restricted to Canada

Besides the above mentioned single Canadian endemic, there are 11 Canadian species that have not been recorded from the United States. All of them are Holarctic but only two of them are considered native to Canada: *Crossocerus lundbladi* Kjellander (Nunavut) and *Mimumesa sibiricana* R. Bohart (Northwest Territories). The other nine have apparently been introduced by accident through human agency (see Table 5 for distributions): *Crossocerus capitosus* (Shuckard), *C. binotatus* Lepeletier & Brullé, *Rhopalum gracile* Wesmael, *Miscophus ater* Lepeletier, *Passaloecus eremita* Kohl, *Pemphredon morio* vander Linden, *P. mortifer* Valkeila, *Spilomena troglodytes* (vander Linden) and *Psenulus laevigatus* (Schenck). In summary, 519 of the 531 Canadian species have also been recorded from the U.S. Most of the species that have not been found there yet have probably just been overlooked or are expected to expand their ranges into the U.S. in the near future.

Alaskan species

The Alaskan fauna includes 63 species in 24 genera. Eight genera (*Bembix* Fabricius, *Gorytes*, *Nysson*, *Rhopalum* Stephens, *Solierella*, *Trypoxylon* Latreille, *Stigmus* Panzer, *Podalonia* Fernald) and 31 species are newly recorded for the state. Alaska has no unique species; all occur in Canada as well. *Crabro maeklini*, *Crossocerus wesmaeli* (Vander Linden) and *Mimumesa atratina* (Morawitz) are the only species that occur in no other U.S. state except Alaska. Twenty-four species (38%) are Holarctic, one of which was apparently introduced recently (*Ectemnius cephalotes* (Olivier), iNaturalist 2021n). The total number of Alaskan species represents 11.9% of the species in the area of the checklist. This percentage is similar to the percentage of Alaska's surface

area (14.7%) in relation to that of Canada and Alaska combined. The vast majority of Alaskan species are widely distributed in Canada, with a few notable exceptions (all of which represent new records). *Bembix americana* Fabricius is widespread in North America but does not reach the Canadian Territories (Yukon, Northwest Territories, Nunavut). It is known from a single record near Hoonah in Sitka Borough (iNaturalist 2022b). *Crabro florissantensis* Rohwer is a Cordilleran species with a single record from Haines, Alaska (UAM 2024). It ranges from British Columbia and Alberta south to California and Colorado (Bohart 1976). Only two other Alaskan species have ranges that are restricted to western Canada and the western U.S.: *Solierella blaisdelli* (Bridwell) ranges from central Alaska (iNaturalist 2024b) and the Northwest Territories through Alberta and British Columbia to Arizona and California (Krombein 1979). *Crabro pallidus* Fox has been recorded from the Yukon, British Columbia, Alberta and Saskatchewan, south to Idaho, Colorado, Utah and California (Bohart 1976; Weissmann and Kondratieff 1999). The smallest Nearctic ranges among Alaskan species occur in two Holarctic species that are widespread in the northern Palearctic region: *Crabro maeklini* is only known from Alaska and the western part of the Canadian Territories in the Nearctic. It ranges east to Kugluktuk, Nunavut (BOLD 2024a). Apart from Alaska, *Crossocerus wesmaeli* has only been recorded from Yukon and Northwest Territories, ranging east to “Reindeer Depot” (= Reindeer Station) (specimen at CNC). It is possible, however, that both species are more widespread in northern Canada since the fauna of this region has not been documented very well. Even though the Alaskan fauna is moderately well known, more new discoveries can be expected.

Species with restricted distributions

Roughly one-quarter of the species (137 spp.) in this checklist have been recorded only from a single province or territory. Many of them are widely distributed in the United States but their ranges only marginally extend into Canada. Some introduced species have restricted ranges because they only recently arrived in Canada (see Introduced species, below). Some of the arctic species are only known from a single jurisdiction (e.g., *Crossocerus lundbladi* from Nunavut, *Mimumesa sibiricana* from Northwest Territories), which might reflect our fragmentary knowledge of the arctic fauna.

British Columbia has the largest number of unique species (63 spp.), followed by Ontario (43 spp.) and Alberta (21 spp.). All other provinces and territories have a maximum of one or two unique species, which might be due to a lack of study. These findings are not unexpected. The fauna of British Columbia is isolated by the Rocky Mountains which provide an effective distribution barrier. Ontario extends farther south than any other Canadian province, including habitat types such as the Carolinian forest that do not exist in other provinces (Government of Canada 2024). The fact that Alberta has significantly more exclusive species than the other prairie provinces may be in part caused by climate since isotherms are shifted northward on the western side of the continent (Atlas of Canada 1906). Apart from that, it might also reflect increased research activity in recent years.

Connections with other biogeographic regions

Holarctic species

A total of 53 species (10%) in the area of the checklist have Holarctic distributions, eleven of which are recorded for the first time from the Nearctic region (listed below and in Table 5: CAN in red font). Only 29 of the 53 species occur naturally in the Holarctic, the other 24 have attained their Holarctic ranges by means of accidental introductions: 21 of them have been introduced from the Palearctic to the Nearctic (including seven new records, see Table 5), two from the Nearctic to the Palearctic (*Isodontia mexicana* (de Saussure), *Sceliphron caementarium* (Drury)), and one species of Oriental origin, *Sceliphron curvatum* (F. Smith), has been introduced to both regions (also a new record, see Table 5). Three Palearctic species are recorded for the first time from the Nearctic region and are considered native to North America: *Crabro maeklini* (based on a newly discovered synonymy, see Appendix 1: Taxonomy notes), *Crossocerus lundbladi* and *Mimumesa sibiricana* (both newly discovered in the Canadian Arctic). They are deemed native because of their apparent Beringian distribution and the remoteness of their northern Nearctic locations, far removed from established shipping and travel routes. Introduced species are discussed in a separate section below. The number of naturally Holarctic species is an overestimate since several species show significant genetic divergences between populations from each continent. For example, this is true for *Pemphredon lugubris* (Fabricius) and *P. montana* Dahlbom (see Appendix 1: Taxonomy notes). Furthermore, DNA barcodes of *Crossocerus barbipes* (Dahlbom) from the Nearctic are more divergent from Palearctic *C. barbipes* than from the closely related Nearctic species *C. stricklandi* Pate (see Appendix 1: Taxonomy notes). A similar situation exists in Vespidae, in which several Nearctic species have recently been reinstated as valid species after previously being synonymized with their Palearctic sister species (Carpenter and Glare 2010; Kimsey and Carpenter 2012; Fateryga 2022; Fateryga et al. 2023). This underlines the need for further research on the status of Holarctic apoid wasp species.

Some Holarctic species have an arctic or predominantly arctic distribution in North America, namely *Dryudella pinguis* (Dahlbom), *Crabro maeklini*, *Crossocerus wesmaeli*, *C. lundbladi* and *Mimumesa sibiricana*. Most of the naturally Holarctic species have a primarily boreal, transcontinental distribution in North America. A notable exception to this pattern is *Tachysphex psammobius* (Kohl), which occurs in southern British Columbia, southern Alberta and the western U.S. (Pulawski 1988), far removed from the former Beringian land bridge. In the Palearctic, it is widely distributed from Europe to Siberia but is also absent from northern regions such as Fennoscandia and Russia north of 59°N (Pulawski 1988).

Species shared with Mexico and the Neotropical region

A surprisingly high number of Canadian species (145 spp., 27% of species in the area of the checklist) range south into Mexico (Pulawski 2025). Eight of them also reach Central America, and seven extend into South America. The three species that range the farthest south are *Sphex ichneumoneus* (Linnaeus), *Prionyx thomae* (Fabricius) and *Trypoxylon lactitarse* de Saussure, all of which reach Argentina (Pulawski 2025).

Distribution patterns within North America

The distribution patterns of Canadian/Alaskan species can be classified as follows: 24.9% (132 spp.) are transcontinental, 37.1% (197 spp.) are western, 31.6% (168 spp.) are eastern and 5.6% (30 spp.) have a central distribution (for definitions of these terms please refer to the Introduction). Only three-quarters of the transcontinental species occur from coast to coast in Canada/Alaska, the other quarter (35 spp.) only attains both coasts south of the border. The ranges of some transcontinental species are broadly disjunct in Canada, e.g., in *Tachysphex antennatus* Fox and *Trypoxylon tridentatum* Packard, both of which are only known from Ontario and British Columbia (see Table 2). These distribution gaps are not caused by insufficient sampling but have likely to do with the fact that the warmest climates within Canada are present in these two provinces (Atlas of Canada 1906). Smaller distribution gaps (e.g., including only two provinces) are found in many species. In some cases, the gaps are real, in others they are due to a lack of sampling. Among the species in this checklist, true range disjunctions occur only in introduced species (see separate paragraph, below). The ranges of some transcontinental species barely extend into Canada and include merely one or two provinces, e.g., in the case of *Cerceris bicornuta* Guérin-Ménéville (only in Ontario) and *Tachytes distinctus* F. Smith (only in British Columbia). Almost one-third (63 spp.) of western species are restricted to British Columbia within the area of the checklist. The number of western species is expectedly higher than that of eastern species since western North America shows a more varied topography with increased levels of geographic isolation, greater altitudinal differences and more diverse climatic conditions.

Another expected biogeographic pattern is the large number of southern species (410 spp.), which constitutes over three-quarters of the species in the checklist. Only 60 species (11.3%) have a northern or boreo-montane distribution. The remainder have intermediate distributions or are data-deficient. Despite the fact that some apoid wasp genera (e.g., *Crabro*, *Crossocerus*, *Mimumesa*) include a significant proportion of cold-adapted species, apoid wasps overall are much more diverse in southern regions (Krombein 1979).

Remarkable new records for the area of the checklist

A number of new Canadian records represent significant extensions with regard to their previously documented ranges. The most remarkable ones include (ordered as in Table 2):

Parammoplanus irwini N. Smith (Fig. 5) was previously only known from California, Nevada and Utah (Smith 2010). New records from the Milk River in southern Alberta (PMAE) and Osoyoos, British Columbia (RBCM) extend the known range northward by roughly 1000 km.

Parammoplanus verrucosus N. Smith was previously only known from Nevada and Utah (Smith 2010). New records from Osoyoos, British Columbia (RBCM) represent a range extension by approximately 1000 km.

Gorytes dorotheae Krombein is an eastern species that was previously known from Maryland to Florida and Louisiana (Krombein 1979). The records from Sandilands

in southeastern Manitoba (WRME) are completely unexpected. The Canadian specimens have extensive black markings on the head but otherwise agree well with specimens from the U.S.

Epinysson metathoracicus (H. Smith) was described from Sioux County, Nebraska (Smith 1908) and has apparently never been collected again since its original discovery (Pulawski 2025). Two specimens from Medicine Hat, Alberta (PMAE) represent the first Canadian records. We suspect that this species might be a kleptoparasite of *Harpactus gyponae* Williams, another rare bembicine wasp that was collected at the same time and locality.

Crossocerus lundbladi is a Palearctic species that is recorded for the first time from the New World in Nunavut (Kugluk Territorial Park, BIOUG). Palearctic records are mostly from Europe, except for one record from Krasnoyarsk Krai in eastern Siberia (Pulawski 2025).

Lindenius montezuma (Cameron) is a southwestern species that was previously known from Oklahoma (BMEC, Kimsey in litt.), western Texas to southern California and Mexico (Krombein 1979). It was newly discovered in the Milk River Natural Area of southern Alberta in 2024.

Tachysphex paiute Pulawski was previously only known from California and Baja California (Pulawski 1988). Records from several sites in southern Alberta (PMAE) extend the known distribution north-northeast by over 1500 km.

Tachysphex scopaeus Pulawski was previously only known from Texas and Mexico (Pulawski 1988, 2025). The discoveries in southern Alberta and southern Saskatchewan (PMAE, RSKM) represent a range extension of approximately 2000 km.

Solierella. Five species in this genus are recorded for the first time from Canada, the largest number of new Canadian records for any genus in this checklist. Most of them represent significant range extensions, especially *S. arcuata* Williams, which was previously only known from California (Krombein 1979), and *S. cingulis* R. Bohart, which was known from Arizona, New Mexico and Texas (Bohart 1991). *Solierella* species are small, rarely collected, and their ranges remain poorly documented. A good example is *S. levis* Williams, which was only known from the southwestern U.S. before it was first recorded from Ontario and Canada by Buck (2004). In the meantime, it has been recorded from every province west of Ontario except Manitoba (see Table 2). Furthermore, the PMAE has a specimen from St. Johns County, Florida, indicating a previously undocumented, widespread occurrence in the Nearctic region.

Spilomena chypearis N. Smith was previously only known from California and Nevada (Bohart and Smith 1995). The first Canadian records are from Alberta (PMAE) and British Columbia (SMDV), with the northernmost from Slave Lake, Alberta.

Spilomena species are among the smallest apoid wasps and also poorly known.

Eucerceris montana Cresson was originally described from Montana in 1882 but had never been found there again (Scullen 1968). Subsequently, the species has been recorded from Utah, Colorado, Kansas, south into central Mexico. The recent discovery at three sites in extreme southern Alberta (PMAE) confirms that the species is still extant in the northern part of its range.

Mimesa ipai Finnamore was described from California and has apparently never been recorded outside that state. A new record from the Okanagan region in British Columbia (RBCM) represents a significant range extension.

Mimumesa sibiricana R. Bohart is a Palearctic species that ranges from western Europe to Kamchatka (Pulawski 2025). It is recorded for the first time from the New World in the Northwest Territories (Norman Wells, PMAE).

Comparison of species richness and density with the Palearctic region

Relative to other areas of the Northern Hemisphere, Canada’s apoid wasp fauna is quite comparable both in diversity and species density. Obvious and meaningful comparisons can be drawn with the fauna of Russia (Belokobylskij and Lelej 2017) and Europe (de Jong 2016) in the Palearctic (Table 4). At the genus level, the diversity of apoid wasps is roughly the same for Canada, Russia and Europe. At the species level, Europe is more diverse (726 spp.) than Russia (685 spp.) and Canada (531 spp.). In apoid wasps, species diversity generally decreases from lower to higher latitudes (e.g., see Lomholdt 1975 for Europe, and Pulawski 1988 for a Nearctic example). Since the lowest latitudes of Canada (41°41'N) and Russia (41°13'N) are similar, species diversity is expected to be comparable. The greater diversity of the European fauna is likely because the lowest latitude of mainland Europe (34°48'N) is significantly south of that of Canada and Russia. Furthermore, the European fauna is probably better known than the fauna of North America and most of Russia. With respect to species density, the apoid wasp fauna of Canada (53.2 species/million km²) has a slightly higher density than Russia (44.8). As noted previously, there are no apoid wasps recorded from Greenland and all species recorded from Alaska are also present in Canada. Therefore, the species density of all of northern North America is lower (38.1), but still relatively similar to Russia. Europe has about the same land mass as Canada (10.5 million km² versus 9.99 million km²) and has therefore a higher species density (69.1 species/million km²). At the continental level, however, North America (Canada plus the continental U.S.) has nearly the same species density (69.0 species/million km²) as Europe.

Table 4. Species numbers of apoid wasps compared to other regions of the northern hemisphere.

| Geographic region | Described species | Described genera | Land mass (million km ²) | Species/ million km ² | Reference |
|---------------------------|-------------------|------------------|--------------------------------------|----------------------------------|--------------------------------|
| Canada + AK + GL | 531 | 84* | 13.9 | 38.3 | Current study |
| Canada | 531 | 84* | 9.99 | 53.2 | Current study |
| Canada + continental U.S. | 1365** | 114 | 19.8 | 69.0 | Pulawski (2025) |
| Russia | 685 | 87 | 15.3 | 44.8 | Belokobylskij and Lelej (2017) |
| Europe | 726 | 82 | 10.5 | 69.1 | de Jong (2016) |

* Two additional genera are known from Canada but are excluded from the main checklist because described species are not recorded – see beginning of Results and Discussion. ** Includes ten new Nearctic records from the present checklist.

Table 5. Checklist of introduced species of apoid wasps in Canada and Alaska. See Methods for the description of acronyms. Formatting follows Table 2: records in black, regular font are published, records in red are new, records in blue are based on literature data alone. Explanations: **ORIGIN** – region of origin (EUR: Europe – species with west Palearctic native range; EUR+: presumably Europe – species with trans-Palearctic native range); ASI: east Asia, including east Palearctic and east Oriental, see discussion).

| | CAN | AK | YT | NT | NU | BC | AB | SK | MB | ON | QC | NB | PE | NS | LB | NF | ORIGIN |
|--------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|
| FAMILY CRABRONIDAE | | | | | | | | | | | | | | | | | |
| SUBFAMILY CRABRONINAE | | | | | | | | | | | | | | | | | |
| <i>Crossocerus annulipes</i> | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | NB | PE | NS | – | – | EUR+ |
| <i>Crossocerus capitosus</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | EUR+ |
| <i>Crossocerus binotatus</i> | CAN | – | – | – | – | – | – | – | – | – | QC | – | – | – | – | – | EUR+ |
| <i>Ectemnius cephalotes</i> | CAN | AK | – | – | – | BC | AB | – | MB | ON | QC | NB | PE | NS | – | NF | EUR+ |
| <i>Rhopalum gracile</i> | CAN | – | – | – | – | BC | – | – | – | – | – | – | – | – | – | – | ASI? |
| SUBFAMILY MISCOPHINAE | | | | | | | | | | | | | | | | | |
| <i>Miscophus ater</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | EUR+ |
| SUBFAMILY OXYBELINAE | | | | | | | | | | | | | | | | | |
| <i>Oxybelus bipunctatus</i> | CAN | – | – | – | – | – | – | – | MB | ON | QC | NB | – | NS | – | – | EUR+ |
| SUBFAMILY TRYPOXYLINAE | | | | | | | | | | | | | | | | | |
| <i>Pison koreense</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | ASI |
| <i>Trypoxylon attenuatum</i> | CAN | – | – | – | – | BC | – | – | – | ON | QC | – | – | – | – | – | EUR |
| <i>Trypoxylon clavicerum</i> | CAN | – | – | – | – | BC | – | – | – | ON | QC | – | – | – | – | – | EUR+ |
| <i>Trypoxylon figulus</i> | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | EUR+ |
| <i>Trypoxylon kolazyi</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | EUR |
| FAMILY PEMPHREDONIDAE | | | | | | | | | | | | | | | | | |
| SUBFAMILY PEMPHREDONINAE | | | | | | | | | | | | | | | | | |
| <i>Diodontus minutus</i> | CAN | – | – | – | – | BC | AB | SK | MB | ON | QC | – | – | – | – | – | EUR+ |
| <i>Passaloecus eremita</i> | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | EUR |
| <i>Passaloecus gracilis</i> | CAN | – | – | – | – | BC | AB | – | – | ON | QC | – | – | – | – | – | EUR |
| <i>Passaloecus singularis</i> | CAN | – | – | – | – | BC | – | – | – | ON | QC | NB | – | NS | – | NF | EUR+ |
| <i>Pemphredon lethifer</i> | CAN | – | – | – | – | BC | AB | – | – | ON | QC | NB | PE | NS | – | NF | EUR+ |
| <i>Pemphredon morio</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | NS | – | – | EUR+ |
| <i>Pemphredon mortifer</i> | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | – | – | – | EUR+ |
| SUBFAMILY SPILOMENINAE | | | | | | | | | | | | | | | | | |
| <i>Spilomena troglodytes</i> | CAN | – | – | – | – | BC | – | – | – | ON | QC | – | – | – | – | – | ASI? |
| FAMILY PSENIDAE | | | | | | | | | | | | | | | | | |
| <i>Psenulus laevigatus</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | EUR+ |
| <i>Psenulus schencki</i> | CAN | – | – | – | – | – | – | – | – | ON | – | – | – | – | – | – | EUR |
| FAMILY SPHECIDAE | | | | | | | | | | | | | | | | | |
| <i>Sceliphron curvatum</i> | CAN | – | – | – | – | – | – | – | – | ON | QC | – | – | NS | – | – | ASI |
| TOTAL (introduced) | 23 | 1 | 0 | 0 | 0 | 10 | 5 | 2 | 4 | 21 | 15 | 5 | 3 | 7 | 0 | 3 | |
| % introduced | 4.3 | 1.6 | 0.0 | 0.0 | 0.0 | 3.4 | 1.5 | 0.8 | 2.1 | 7.2 | 7.2 | 4.2 | 5.5 | 7.6 | 0.0 | 7.1 | |
| TOTAL (introduced & native) | 531 | 63 | 76 | 76 | 3 | 292 | 326 | 248 | 195 | 294 | 209 | 118 | 55 | 92 | 20 | 42 | |

Nesting habits and biogeography

More than two-thirds (68.5%) of Canadian/Alaskan apoid wasps nest in the ground (364 spp.), 127 species (23.9%) nest in cavities, four (0.8%) are mud daubers (Figs 88–89), 26 (4.9%) are kleptoparasites of ground-nesting species, one (0.2%) is a

koinobiont ectoparasitoid and nine (1.7%) have unknown nesting habits (see Methods: Nesting habits). Cavity nesters are underrepresented in the Prairie provinces, ranging from 16.1–20.0% of the species total. Conversely, ground nesters are overrepresented. This is to be expected since the southern, more diverse parts of the Prairie provinces are largely treeless. British Columbia's numbers are close to the overall average, whereas all other provinces, territories and Alaska show a more or less pronounced bias towards cavity nesters. This bias is most extreme on the island of Newfoundland (71.4% of species).

Introduced species

Twenty-three species (4.3% of the fauna of the area of this checklist) have been introduced accidentally, eight of which are recorded here for the first time (indicated by CAN in boldfaced, red font in Table 5). There have been no deliberate introductions of apoid wasp to North America. The highest incidence of introductions was found in Ontario (21 spp.), followed by Quebec (15 spp.), British Columbia (10 spp.) and Nova Scotia (7 spp.). The provinces with the highest percentage of introduced species are Nova Scotia (7.6%), Quebec (7.2%), and Ontario and the island of Newfoundland (both 7.1%). The highest number of introduced species in the Canadian Prairies occurs in Alberta with five species. Alaska has only one introduced species, the Canadian Territories and Labrador none.

Most of the introduced species (21 spp., Table 5) are of Palearctic origin, one is Oriental (*Sceliphron curvatum*), and one is of uncertain origin (see below). The majority of Palearctic introductions is thought to be of European origin because the species were first introduced to eastern North America. It should be noted, however, that the majority of species of putative European origin have vast Palearctic ranges that attain the Pacific coast in the east (range information based on Belokobylskii and Lelej 2017). The only species restricted to the western Palearctic are *Trypoxylon attenuatum* F. Smith, *T. kolazyi* Kohl, *Passaloecus eremita*, *P. gracilis* (Curtis) and *Psenulus schencki* (Tournier). *Pison koreense* Radoszkowski was introduced from east Asia, either from the Palearctic or the Oriental part. It was likely transported to the eastern U.S. in nests attached to military equipment that returned from Asia during or shortly after World War II (Krombein 1958). *Rhopalum gracile* ranges across the Palearctic but it likely originated from the eastern Palearctic because it was introduced to British Columbia (Ratzlaff et al. 2016). The origin of *Spilomena troglodytes* is unclear. It ranges across the Palearctic and was first recorded from Ontario in 2004 (Buck et al. 2006). However, we subsequently discovered four additional specimens from the Victoria area in southern British Columbia in the collection of the Royal Alberta Museum. They date as far back as 1984, indicating that the species was more likely introduced from the east than the west Palearctic. Whether the BC specimens represent the first area of introduction remains uncertain due to the very small body size and poor detectability of this species. The only species of Oriental origin is *Sceliphron curvatum*. However, it was likely introduced from Europe where it arrived roughly three decades before reaching North America (first record from Austria in 1979: van der Vecht 1984). As most other introduced species, it first arrived in eastern North America (exceptions mentioned above).

There is a significant correlation between the time since introduction and the size of the present-day range in North America (Table 6). *Ectemnius cephalotes* is the first documented introduction to Canada (before 1882, see Table 6). It also has the largest present-day range, which includes almost all Canadian provinces, as well as Alaska (first record from 2021, iNaturalist 2021n). *Crossocerus annulipes* (Lepeletier and Brullé), which was introduced before 1921 has a similarly large range. A striking exception is *Trypoxylon figulus* (Linnaeus), which is only known from a relatively small area in eastern Ontario and Quebec, despite being one of the first species that was introduced to Canada (Pulawski 1984). One species might have been extirpated: *T. kolazyi* has not been collected since 1977 (Buck 2004). Whether this has to do with the spread of a closely related, now common, introduced species, *T. clavicerum* Lepeletier and Serville, is unknown. In a similar case, collection data from the University of Guelph show that Ontario populations of *Ancistrocerus parietum* (Linnaeus), a cavity-nesting, introduced mason wasp, crashed at the same time when the introduced *A. gazella* (Panzer), moved into southern Ontario. In Ontario, the former is currently only known from a few marginal locations whereas *A. gazella* is common and widespread.

DNA barcoding data (BOLD 2024c) confirm that some species that earlier authors (e.g., Krombein 1951) tentatively considered adventive in North America are in fact introductions rather than naturally occurring Holarctic species. For example, Nearctic and Palearctic populations of both *Ectemnius cephalotes* and *Crossocerus annulipes* show virtually no genetic divergence and form mixed clades on COI trees. The chronicle of introduction events also shows that the pace of introductions to Canada has increased in recent decades. Nine of the 23 introduced species (39%) in Table 6 were first detected after 2000. By comparison, both the first and the second half of the twentieth century saw only six introductions each.

As was already reported for introduced species in Ontario (Buck 2005), cavity nesters are strongly overrepresented within the suite of species introduced to North America. Even though cavity nesters only make up 22% of native species in the area of the checklist, they include 78% of introduced species. The same is true for species that construct mud nests. There are only two native mud daubers in Canada (0.4% of the fauna), matched by two introduced species (9% of introduced species). The reason for these skewed ratios is that accidental transplantation of nests is the most likely mode of introduction in solitary aculeate wasps (Buck 2005). Adult wasps, on the other hand, are unlikely to survive long voyages. Cavity nests and mud nests can easily be transported between continents with lumber, building materials, wooden pallets, other shipped goods or attached to equipment. Topsoil, on the other hand is rarely shipped, and thus ground-nesting species are far less likely to be transported between continents. For instance, Kurczewski (1998) proposed that *Oxybelus bipunctatus* Olivier, a ground-nesting species that was introduced from Europe, likely arrived in North America with molding sand or in ship ballast. This would likely also be true for *Diodontus minutus* (Fabricius) (Fig. 61), the only other common, introduced, ground-nesting species in North America, which has never been explicitly recognized as introduced. It was first recorded from North America as a species new to science (*Xylocelia franclemonti* Krombein), with records from

Table 6. Chronological introduction history of apoid wasps in Canada and Alaska, including nest types and hosts. Explanations: **ORIG.** – region of origin (EUR: Europe, species with west Palearctic native range; EUR+: presumably Europe, species with trans-Palearctic native range; ASI: east Asia, including east Palearctic and east Oriental, see discussion); **OCC.** (Occurrence) – number of political regions (provinces + territories + Alaska) where each species has been recorded from (compare to Table 5); **FIRST REC.** – year in which the first known specimen was collected in North America, or year of publication (denoted by *) of the first record if year of collection is unknown; **FIRST FROM** – province or state where the species was first collected (acronyms of Canadian provinces as in Tables 1-3 and 5; MA: Massachusetts, NJ: New Jersey, NY: New York, VA: Virginia, e.: eastern); **DISTR.** (Distribution type, as defined in Methods) – T: transcontinental, E: eastern, W: western, E/W: disjunct eastern/western; **NEST** – cavity: cavity nesters, ground: ground nesters, mud: mud daubers; **REFERENCE/DEPOSITORY** – references for first records or acronyms of depositories (see Methods).

| SPECIES | ORIG. | OCC. | FIRST REC. | FIRST FROM | DISTR. | NEST | HOST GROUP | REFERENCE / DEPOSITORY |
|-------------------------------|-------|------|------------|-------------|--------|--------|----------------------|--|
| <i>Ectemnius cephalotes</i> | EUR+ | 10 | 1882* | QC | T | cavity | Diptera | Provancher 1882 (as <i>Crabro aciculatus</i>) |
| <i>Trypoxylon figulus</i> | EUR+ | 2 | 1891* | CAN, MA | E | cavity | Araneae | Fox 1891 (as <i>Trypoxylon apicalis</i>) |
| <i>Crossocerus annulipes</i> | EUR+ | 9 | 1921* | MA | T | cavity | Homoptera | Banks 1921 (as <i>Blepharipus parkeri</i>) |
| <i>Passaloecus singularis</i> | EUR+ | 6 | 1921 | MA | E | cavity | Aphididae | Krombein 1938 (as <i>Passaloecus gertrudis</i>) |
| <i>Diodontus minutus</i> | EUR+ | 6 | 1934 | NY | T | ground | Aphididae | Krombein 1939 (as <i>Xylocelia franclemonti</i>) |
| <i>Oxybelus bipunctatus</i> | EUR+ | 5 | 1935 | NJ | E | ground | Diptera | Kurczewski 1998 |
| <i>Passaloecus gracilis</i> | EUR | 4 | 1941 | VA | E/W | cavity | Aphididae | Krombein 1961 (as <i>Passaloecus turionum</i>) |
| <i>Trypoxylon clavicerum</i> | EUR+ | 3 | 1949 | MI | E/W | cavity | Araneae | Coville 1984 |
| <i>Trypoxylon kolazyi</i> | EUR | 1 | 1952 | ON | E | cavity | Araneae | Buck 2004 |
| <i>Pison koreense</i> | ASI | 1 | 1954 | VA | E | mud | Araneae | Krombein 1958 |
| <i>Pemphredon lethifer</i> | EUR+ | 8 | 1959* | ON, e. U.S. | E/W | cavity | Aphididae | Krombein 1959 |
| <i>Trypoxylon attenuatum</i> | EUR | 3 | 1960 | ON | E/W | cavity | Araneae | Buck 2004 |
| <i>Spilomena troglodytes</i> | ASI? | 3 | 1973 | BC | E/W | cavity | Thysanoptera | CNC, examined |
| <i>Pemphredon mortifer</i> | EUR+ | 2 | 1974 | ON | E | cavity | Aphididae | DEBU, examined |
| <i>Pemphredon morio</i> | EUR+ | 2 | 2001 | ON | E | cavity | Aphididae | Buck 2004 |
| <i>Miscophus ater</i> | EUR+ | 1 | 2004 | ON | E | ground | Araneae | DEBU, examined |
| <i>Passaloecus eremita</i> | EUR | 2 | 2010 | ON | E | cavity | Aphididae | BOLD 2011 |
| <i>Psenulus schencki</i> | EUR | 1 | 2013 | ON | E | cavity | Homoptera | BIOUG, examined |
| <i>Sceliphron curvatum</i> | ASI | 3 | 2013 | QC | E | mud | Araneae | BugGuide 2013e |
| <i>Crossocerus capitosus</i> | EUR+ | 1 | 2014 | ON | E | cavity | Diptera | BIOUG, examined |
| <i>Rhopalum gracile</i> | ASI? | 1 | 2015 | BC | W | cavity | Diptera / Psocoptera | Ratzlaff et al. 2016 |
| <i>Psenulus laevigatus</i> | EUR+ | 1 | 2015 | ON | E | cavity | Homoptera | BIOUG, examined |
| <i>Crossocerus binotatus</i> | EUR+ | 1 | 2018 | QC | E | cavity | Diptera | BugGuide 2018 |

New York and Rhode Island (Krombein 1939). Subsequently, it was discovered in several other states in the northeastern U.S. (Krombein 1951, 1979). Half a century after its description, Eighme (1989) synonymized *D. franclemonti* with the Palearctic *D. minutus*, without commenting on its occurrence status in North America.

By then, the species had spread to Washington State and California on the other side of the continent. Its advance in Alberta can be reconstructed through specimens at the Royal Alberta Museum. The species was first collected in extreme southern Alberta (Writing-on-Stone Provincial Park) in 1982, but it was notably absent (unlike other *Diodontus* species) in collections taken elsewhere in Alberta before 2000. From 2009 to the present, however, we found *D. minutus* to be nearly ubiquitous in the southern half of the province. Within its present range, it now appears to be the most common introduced apoid wasp species in Canada, albeit easily overlooked due to its small size. *Diodontus* species can be considered beneficial because their hosts are aphids, but, as PMAE collection data for Alberta suggests, the introduction of *D. minutus* might have contributed to a decline of the native species *D. americanus* Packard in that province.

Another class of introductions involves species that have been transplanted within the Nearctic region by human activity. This is the case for many of the European introductions with disjunct eastern Canadian/British Columbian distributions as well as some native Nearctic species such as *Isodontia mexicana* (Fig. 86) on the Pacific Coast. The sudden appearance of the latter from the late 2000s to the late 2010s in California (first record 2007, BugGuide 2010), Oregon (first record 2014, iNaturalist 2018b), Washington (first record 2018, iNaturalist 2018c) and British Columbia (first record 2018, iNaturalist 2018d) likely started with one or more accidental introductions from the eastern part of the range. The rapid spread within its western range was probably also aided by human activity. Conversely, *Isodontia elegans* (F. Smith), a western species, has been introduced to eastern North America, including southern Ontario (Buck et al. 2006).

From a North American perspective, the focus of attention concerning accidental introductions is usually on species that arrive here from other biogeographic regions. However, it is important to point out that a number of Nearctic species have likewise been exported to other biogeographic regions, even though this number is much smaller than the number of introductions to North America. Among the species in this checklist, the most successful tramp species is *Sceliphron caementarium* (Figs 83, 89). It has been introduced to Europe, Madeira, Japan, Hawaii, South America (Pulawski 2025), and, according to more recent citizen science observations, to Bermuda (iNaturalist 2021m), the Azores (iNaturalist 2022l), the Canary Islands (iNaturalist 2020d), Oman (iNaturalist 2020s), South Korea (iNaturalist 2016), Australia (iNaturalist 2022k), New Caledonia (iNaturalist 2019k) and Vanuatu (iNaturalist 2023k). Other species that originated from the Nearctic include *Chalybion californicum* (de Saussure) (Fig. 82) (introduced to Bermuda, Peru, Hawaii), *Isodontia mexicana* (Europe, Hawaii) (Fig. 86), *Prionyx thomae* (Hawaii), *Solierella peckhami* (Ashmead) (Hawaii, Marshall Islands), *Tachysphex apicalis* Fox (Hawaii) and *Dryudella picta* (Kohl) (Hawaii) (Pulawski 2025). Surprisingly, this list includes fewer cavity nesters than ground-nesters (2 as opposed to 3 spp.), contrary to introduction patterns from the Palearctic to the Nearctic where cavity nesters predominate (see discussion above).

Ecological impact of introductions

So far none of the introduced species have shown any invasive tendencies. Seven of them provision their nests with aphids (all Pemphredonidae species) and can therefore be considered beneficial. The other species mostly have spider, Diptera and Homoptera hosts (see Table 6). With one exception (*Diodontus minutus*, Pemphredonidae), none of the introduced species have become very common. Furthermore, there is little indication that introduced species have displaced native species. Besides the *Diodontus* example (see previous section), the only possible exception might be *Trypoxylon attenuatum* F. Smith, which is now the most common slender-bodied species of the *T. figulus* species group in southern Ontario. Based on collection data at the University of Guelph, the similar, native *T. pennsylvanicum* de Saussure seems to have declined after the arrival of *T. attenuatum*. It used to be a fairly common species but is now relatively rarely collected. However, it is unclear whether there is a causal connection between the population changes of both species. In other groups of aculeate wasps, we know of a few cases in which the arrival of an introduced species has had a demonstrable negative impact on closely related native species. This is well documented in the European Paper Wasp, *Polistes dominula* (Christ) and the native Northern Paper Wasp, *P. fuscatus* (Fabricius) (Liebert et al. 2006). It is believed that greater reproductive potential combined with initial liberation from parasites and parasitoids gave *P. dominula* a competitive advantage over its native Nearctic counterpart (Miller et al. 2013). So far, the only aculeate wasp species that have been reported as invasive involve social vespids. They include about half a dozen species of paper wasps (*Polistes* Latreille), yellowjackets (*Vespula* Thomson) and hornets (*Vespa* Linnaeus) worldwide (Beggs et al. 2011).

Faunal change

Unlike their close relatives, the bees, apoid wasps have not been the subject of many studies concerning faunal change. Unfortunately, the scarcity of historical and present-day data, especially for western Canada, limits our ability to document faunal change. Our analysis is therefore limited to eastern Canada. Of the 20 new Canadian records that were found in the eastern provinces, eight were due to introductions from other biogeographic regions (see below under Introduced species), one was previously misidentified (*Pemphredon rugifer* sensu Dollfuss 1995 = *P. bipartior* Fox, **sp. restit.**, in part), and five involve isolated, older records that were only identified recently (*Ammoplanus unami* Pate, *Stigmus fulvicornis* Rohwer, *S. inordinatus universitatis* Rohwer, *Cerceris compar* Cresson, *Mimumesa johnsoni* (Viereck)). The remaining six species (*Psammaletes mexicanus* (Cameron), *Glenostictia pictifrons* (F. Smith), *Tachytes mergus* Fox, *T. obductus* Fox, *Larra analis* Fabricius and *Pseneo longiventris* (Cameron)) represent more recent records from one or two, mostly peripheral localities, based on very few specimens or observations. We therefore have insufficient evidence to suggest that any of these species have recently expanded their ranges into Canada. Nonetheless, we can detect obvious range expansions within eastern Canada for several common species.

Reliable baseline data for these species exists for both Ontario and Quebec (Finnamore 1983; Buck 2004). New data from iNaturalist provides evidence that at least a dozen species have significantly increased their ranges over the last ten years or so. The most prominent examples are *Cerceris insolita* Cresson, *Sphex pensylvanicus* Linnaeus (Fig. 87), *Ammophila procera* Dahlbom, *Bicyrtes quadrifasciatus* (Say) (Fig. 15), *Cerceris fumipennis* Say, *Sphex ichneumoneus*, *Isodontia mexicana* (Fig. 86), *Philanthus gibbosus* (Fabricius), *Eremnophila aureonotata* (Cameron) (Fig. 78) and *Prionyx atratus* (Lepeletier). Table 7 shows how far these species have advanced northeastward in southern Ontario and southern Quebec. The greatest range expansions are documented in *Cerceris insolita* (850 km) and *Sphex pensylvanicus* (810 km). Three other species (*Bicyrtes quadrifasciatus*, *Cerceris fumipennis* and *Ammophila pictipennis* Walsh) had not previously been found in Quebec but are now well-established there. Based on iNaturalist data, apparent northward range expansions have also occurred in the Canadian Maritimes (see Table 2 for references), namely in *Cerceris atramontensis* Banks, *C. fumipennis*, *Philanthus gibbosus*, *P. ventilabris* Fabricius, *Ammophila fernaldi* (Murray), *A. pictipennis*, *A. procera*, *Eremnophila aureonotata*, *Prionyx parkeri* R. Bohart & Menke (Fig. 85), *Isodontia mexicana*, *Sphex ichneumoneus* (Lewis 2020) and *S. pensylvanicus* (Lewis 2020). All twelve species are newly recorded from New Brunswick. *Cerceris atramontensis*, *Eremnophila aureonotata* and *Isodontia mexicana* are also new to both Nova Scotia and Prince Edward Island. It is unlikely that these conspicuous, easily observed species have merely been overlooked in the past.

The reasons for these range expansions have not been investigated. However, it seems likely that warming of the climate plays an important role. As mentioned previously, apoid wasps are most diverse in warmer climates, both humid and arid (Bohart and Menke 1976; Krombein 1979), with northern distributions of most species apparently limited by cold temperatures. Therefore, rising average temperatures likely create more favorable conditions for a large number of species. Since most apoid wasps, especially larger species, are good fliers they are very capable of dispersing to new areas, thus taking advantage of changing environmental conditions (e.g., Evans 1974). Many species, especially ground nesters, prefer habitats that are subject to successional changes (e.g., see Onuferko et al. 2023). The ability to effectively colonize newly available sites is a requirement to their survival.

Climate change has also been implied as a major cause of range changes in other Apoidea, especially bumble bees (Kerr et al. 2015; Soroye et al. 2020). Interestingly, the impact on *Bombus* Latreille species has been varied. While a few have expanded their ranges (e.g., *Bombus impatiens* Cresson, see Palmier and Sheffield 2019) a much larger number have experienced declines as they are seemingly unable to shift their ranges northward (Kerr et al. 2015). We have not observed declines of northern apoid wasp species in southern Canada but this could be due to a lack of data since most species are not as readily observed as bumble bees. It should be noted, however, that the reasons for bumble bee decline are diverse and remain unknown or speculative in many cases (Colla and Packer 2008; Cameron et al. 2011; Colla et al. 2012). Some of the contributing factors are inapplicable to apoid wasps, such as *Bombus*-specific diseases (Cameron et al. 2011). Decline has also been observed in some species of bees other than *Bombus*

Table 7. Notable recent northeastward range expansions of apoid wasps in Ontario and Quebec, ordered by magnitude. Former distributions based on literature data; range expansions are as documented by verified observations on iNaturalist. Explanations: Prov (Province): ON: Ontario, QC: Quebec; Former range limit – former northeastern limit (E: east; Co.: County); Range limit in 2024 – current northeastern limit; Year – year specimen was collected or observed; Source – publication or website (iNat: iNaturalist).

| Species | Distance | | Baseline data | | | Range expansion | | | |
|---------------------------------|----------|------|--------------------------------|------|----------------|-----------------|--------------------------|------|------------|
| | (km) | Prov | Former range limit | Year | Source | Prov | Range limit in 2024 | Year | Source |
| <i>Cerceris insolita</i> | 850 | ON | Windsor | 2002 | Buck 2004 | QC | Longeuil | 2024 | iNat 2024g |
| <i>Sphex pensylvanicus</i> | 810 | ON | Springwater Prov. Park* | 2002 | Buck 2004 | QC | Saint-Jean-Port-Joli | 2023 | iNat 2024c |
| <i>Ammophila procera</i> | 420 | QC | Saint-Jean-sur-Richelieu | ? | Finnamore 1983 | QC | Tadoussac | 2017 | iNat 2019h |
| <i>Bicyrtes quadrifasciatus</i> | 380 | ON | Perth Road, Frontenac Co. | 1957 | Buck 2004 | QC | Trois-Rivières | 2021 | iNat 2021k |
| <i>Cerceris fumipennis</i> | 360 | ON | Newboro, Leeds & Grenville Co. | 2002 | Buck 2004 | QC | Trois-Rivières | 2021 | iNat 2021l |
| <i>Sphex ichneumoneus</i> | 310 | QC | E of Saint-Jean-sur-Richelieu | ? | Finnamore 1983 | QC | Saint-Urbain, Charlevoix | 2022 | iNat 2022o |
| <i>Isodontia mexicana</i> | 290 | QC | Rigaud | ? | Finnamore 1983 | QC | Québec City | 2022 | iNat 2023j |
| <i>Philanthus gibbosus</i> | 270 | QC | Gatineau | ? | Finnamore 1983 | QC | Trois-Rivières | 2022 | iNat 2022p |
| <i>Eremnophila aureonotata</i> | 140 | QC | Saint-Jean-sur-Richelieu | ? | Finnamore 1983 | QC | Trois-Rivières | 2020 | iNat 2020r |
| <i>Prionyx atratus</i> | 120 | QC | Montréal | ? | Finnamore 1983 | QC | Trois-Rivières | 2022 | iNat 2022n |

* The record from Sherbrooke, QC, in Finnamore (1983) is considered adventive.

(e.g., see examples in Veit et al. 2022), but these changes are probably less well documented. Overall, the outlook for apoid wasp species in Canada appears favorable. We expect that more species will spread northward into Canada increasing the Canadian fauna, and many species that are already present will expand their ranges. Since apoid wasps like other aculeate wasps provide regulatory ecosystem services through “predation” (more precisely: koinobiont parasitoidism) and pollination (Brock et al. 2021) this is not an unwelcome trend. The rapidity with which some of these changes are happening underlines the importance of continued faunistic and biogeographic research.

Citizen science

Citizen science observations have become an important and readily available source of data for many groups of organisms (e.g., Mesaglio et al. 2021, 2023; White et al. 2023). This is certainly also the case for many aculeate wasps, such as apoid wasps. On the citizen science platform iNaturalist alone, the number of apoid wasp observations for Canada and Alaska surpassed 37,000 in 2024 (iNaturalist 2025). Almost two-thirds (62%) of them were made in Ontario, revealing a strongly skewed level of involvement

between political regions. The number of observations submitted on a yearly basis averaged around 6,895 between 2021 and 2024 and might still be increasing (Fig. 91). As of December 2024, 25,145 observations (68%) were identified to species level, documenting 229 species. This includes a surprising 43% of the total number of species known from the area of the checklist. From 2019 to 2024, an average of 23 new species were newly identified on the platform each year (Fig. 91). Due to the fact that a large number of identifications were made by taxonomic experts (including, amongst others, the senior author) and knowledgeable naturalists (see iNaturalist 2024e) the accuracy of identifications in this group is generally high. Therefore, the data are highly relevant to this study.

The concrete contribution of iNaturalist and BugGuide to the present checklist consists of 1) observations that represent new records, 2) observations in regions for which no museum vouchers exist, 3) documentation of faunal change, both in native and introduced species and 4) images of 49 species of wasps in the plate series (Figs 2–90, in part). Specifically, citizen science contributed four new Canadian species records (see below, 5.7% of total) and 70 regional records (9.9% of total) to the checklist (see Table 2. Note: in four cases, observers subsequently sent specimens to the senior author for identification; these are referenced in the table by museum depository, not by webpage). Citizen science observations contributed over-proportionally in the Canadian Maritime provinces, where there has been a relative lack of academic research. Some of the new records have been surprising and noteworthy, such as the first Canadian records of *Tachytes obductus* and *T. mergus* from Ontario (iNaturalist 2020k, l), and the discovery of *Eucerceris zonata* (Say) (Fig. 69) in Quebec, which was feared to be extirpated in Ontario (Leclerc et al. in press). BugGuide provided the first records of two out of six species that were newly introduced to Canada after 2010, namely *Sceliphron curvatum* and *Crossocerus binotatus* (Table 6). In addition, iNaturalist and BugGuide observations have documented the spread of ten species within Canada (Table 7), contributed 13 new records of introduced species outside the area of the checklist (see under Introduced species) and have provided seven notable local records of rare species in urban areas (see below).

Citizen science observations often take place in or near urban centres, which presents both opportunities and disadvantages (Callaghan et al. 2020). One of the advantages is the early detection of newly introduced species (see Introduced species, above). Besides that, it has also revealed a surprisingly high diversity of apoid wasp species in urban centres such as Toronto. As of December 2024, the city had 97 identified species on iNaturalist, including two new Canadian records (*Tachytes mergus*, *T. obductus*, mentioned above) and several rare species, such as *Bembix pallidipicta* F. Smith (iNaturalist 2020m) (Fig. 14), *Lestiphorus cockerelli* (Rohwer) (iNaturalist 2020n) (Fig. 23), *Stictiella emarginata* (Cresson) (iNaturalist 2020o) (Fig. 30), *Nysson plagiatus* Cresson (iNaturalist 2018a), *Tachysphex pechumani* Krombein (iNaturalist 2021j), *Tachytes intermedius* (Viereck) (iNaturalist 2020p), and *Philanthus sanbornii* Cresson (iNaturalist 2020q). Remarkably, *Stictiella emarginata* had last been collected in Toronto in 1918 (Buck 2004) and was previously only known from one extant locality in Ontario (Kurczewski and Boyle 2006). Citizen science records like these can be of great value to conservation planners.

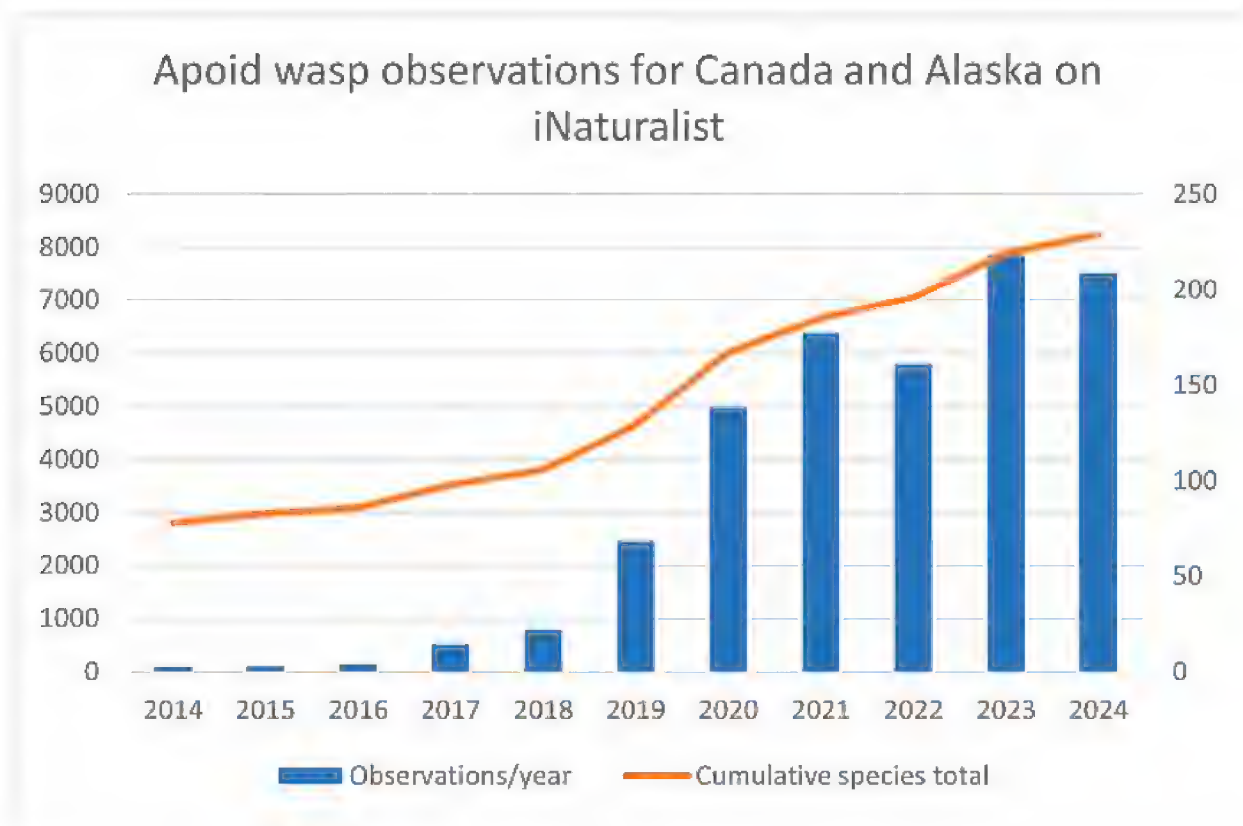


Figure 91. Annual increase of verifiable observations and numbers of species of apoid wasps observed in Canada and Alaska on the citizen science platform iNaturalist from 2014 to 2024 (Source: iNaturalist 2025). Explanations: Y axis (left) and gridlines – number of observations; Y axis (right) – number of species. Years denote when observations were made, not when they were submitted to the website or identified to species. According to iNaturalist’s terminology, verifiable observations include both “research grade” and non-research grade observations.

We would like to encourage naturalists to continue and intensify their exploration of aculeate wasps. We also want to encourage colleagues and taxonomic experts to participate in the identification of citizen science observations, an endeavour that pays off in many different ways (Callaghan et al. 2022).

DNA barcoding

So far, the contribution of DNA barcoding to Nearctic apoid wasp taxonomy has been minimal. Overall, taxonomic research on Nearctic apoid wasps entered into a lull after an era of monumental contributions by Bohart, Menke, Krombein, Pulawski, Leclercq and others (see References section). Of the 84 genera in the area of this checklist, only eight have been reviewed after 2000 (see Table 2), and no major taxonomic revisionary work has been conducted on any Nearctic genus since then. The eight genera that have recently been reviewed (Buck 2007; Holliday and Coelho 2006; Leclercq 2002, 2012; Menke 2020; Smith 2009, 2010, 2019) are for the most part marginally distributed in Canada, including a mere 9.0% (48 spp.) of the total fauna. Up to the present, there has been no study on Nearctic apoid wasps that used DNA barcoding as a critical tool to test morphological species concepts or to uncover cryptic species diversity. DNA barcodes of Nearctic apoid wasps have largely been sampled with the goal of building comprehensive libraries (e.g., through biodiversity field campaigns and by harvesting

tissue from existing museum specimens, see various projects in the Barcode of Life Data System: BOLD 2024c), rather than in a targeted manner with specific taxonomic research objectives in mind. Based on experiences with other groups of aculeate Hymenoptera (Rehan and Sheffield 2011; Buck et al. 2012; Gibbs et al. 2013; González-Vaquero et al. 2016) and apoid wasps in other biogeographic regions (e.g., Schmid-Egger et al. 2018) there can be no doubt about the usefulness of DNA barcoding data for taxonomic research in a Nearctic context. Despite the solid taxonomic framework that was laid by previous research there is still a significant need for detailed studies of many genera that contain cryptic species complexes or species with doubtful Holarctic distributions (see Appendix 1: Taxonomy notes). Currently available sequences on BOLD have helped to shed light on a number of problem taxa that were studied in the context of this checklist (see Appendix 1: Taxonomy notes). Not surprisingly, the library of apoid wasp DNA barcodes still has large gaps. Bennett et al. (2019) assessed DNA barcode data of Canadian Hymenoptera from the BOLD database (Ratnasingham and Hebert 2007). Using the Barcode Index Number (BIN) criterion of Ratnasingham and Hebert (2013) postulating that a 2% divergence in the DNA barcode region of cytochrome oxidase I (COI) is indicative of species differences, Bennett et al. (2019) estimated that there were 362 species of apoid wasps collected in Canada in the BOLD database. Compared to the number of species recorded in Canada in their study (497), this represents 72.8% of the described, recorded species in Canada at that time. This can only be a rough estimate, however, since divergence thresholds or BINs alone have proven inadequate for species delimitation in several other groups of aculeates (e.g., *Polistes* Latreille: Buck et al. 2012; *Lasioglossum* Curtis: Gibbs 2018) and other groups of insects (Diptera: Meier et al. 2006; Lepidoptera: Burns et al. 2007).

Acknowledgements

This checklist builds on the contributions of many individuals and institutions which we acknowledge with great gratitude. We would like to thank John S. Ascher and Wojciech Pulawski for their very helpful and constructive reviews of the manuscript and Michael Ohl for his generous support of the Hymenoptera of Canada, Alaska and Greenland Checklist series as Editor-in-Chief. A substantial number of new provincial records were contributed through the work of previous PMAE curator Albert Finnamore. Furthermore, we would like to thank the following colleagues for sharing new species records, loaning or donating specimens to the PMAE, making pictures of museum specimens available to us, and/or providing access to their collections: Cory Sheffield (RSKM), Karen Needham (SMDV), Claudia Copley and Joel Gibson (RBCM), Jason Gibbs (WRME), Derek Sikes (UAM), Danny Shpeley, Victor Shegelski and Felix Sperling (UASM), David Langor and Greg Pohl (NOFC), Gerald Hilchie (Edmonton, Alberta), Steve Paiero and Steve Marshall (DEBU), Stéphanie Boucher (LEMQ), Allison Brown and Spencer Monckton (BIOUG), André-Philippe Drapeau Picard (IMQC), Randy Mooi (MMMN), Kim Adams and Melissa Fierke (SUNY), Troy Kimoto (Canadian Food

Inspection Agency, Burnaby, British Columbia), Lincoln Best (Corvallis, Oregon), Denis Doucet (Sussex Corner, New Brunswick), Sara Simpkins (Saskatoon, Saskatchewan), Owen Strickland (Toronto, Ontario) and Riley Walsh (Toronto, Ontario). The following colleagues kindly sent type specimens, pictures of type specimens and/or other reference material that helped to clarify the identity of problematic species: Jason Weintraub (ANSP), Seán Brady (USNM), M.J. Paulsen (UNSM), Lynn Kimsey (BMEC), Crystal Maier (MCZC), Zachary Falin and Rachel Osborn (SEMC), Joseph Moisan-De Serres (ULQC), and Taro Eldredge (UMMZ). Christian Schmid-Egger (Berlin, Germany) is thanked for helping to clarify the identity of two introduced Palearctic species. John S. Ascher (National University of Singapore, Singapore) provided the largest number of Canadian/Alaskan apoid wasp identifications on iNaturalist, thus significantly improving the overall quality of the data set, especially for underexplored areas such as the Canadian Territories and Maritime Provinces. Other top identifiers of the iNaturalist dataset who added identifications to more than 2% of the observations were (usernames in angle brackets): Susanna Heideman <susanna_h>, Brian Dagley <bdagley>, Riley Walsh <rileywalsh>, Juan Cepeda Espinosa <juan_sphex>, Milo van Loon <bullema>, Julian Fuchs <jfmantis> and Chris Ratzlaff <cratzlaff> (iNaturalist 2024e). Diana Barnes (retired, CNC), Eric Maw (retired, CNC) and many summer students helped compile and sort data in the CNC and the literature over the past decade. Many thanks also go to Amber Bass (CNC) for checking data and references, formatting text, arranging the plates, facilitating loans of specimens and transforming and uploading the dataset to the Canadensys website. The following photographers kindly granted permission to use their images in the plate series (iNaturalist usernames in angle brackets, where applicable): Steve Marshall, Carroll Perkins <carrollperkins>, Denis Doucet <nbdragonflyguy>, Terry Thormin, Léo-Guy de Repentigny <leoguy>, Bob Noble <bob15noble>, Deanna Dodgson <deannadodgson>, Lisa Hill <watercolorist>, Louise Woodrich <louiseinva>, Alice Abela <alice_abela>, Dave Beadle <dbeadle>, Jillian Cowles <jcowles>, Eric Eaton <bug_eric>, Julian Fuchs <jfmantis>, Heather Holm <heatherholm>, Clarence Holmes <cholmesphoto>, Daniel Horner, Steve Kerr <steve_kerr>, Michael King <mhking>, Will Kuhn <willkuhn>, Donna Lucas <donnalucas>, Stephen Mirick <stevemirick>, Tom Murray, Elena Oey <u_phantasticus>, Ian Routley <apples58>, Owen Strickland <owenstrickland>, and Riley Walsh <rileywalsh>. Alberta Environment and Sustainable Resource Development and Parks Canada are thanked for issuing collecting and research permits to the senior author for protected areas in Alberta. Funding to AMRB was provided by internal grants from Agriculture and Agri-Food Canada.

References

- Acorn JH (2011) Sand hill arthropods in Canadian grasslands. In: Floate KD (Ed.) Arthropods of Canadian grasslands (Volume 2): inhabitants of a changing landscape. Biological Survey of Canada (Ottawa), 25–43. <https://biologicalsurvey.ca/scientific-monographs/> [Access: 7 February 2025]

- Alcock J, Barrows EM, Gord G, Hubbard LJ, Kirkendall L, Pyle DW, Ponder TL, Zalom FG (1978) The ecology and evolution of male reproductive behaviour in the bees and wasps. *Zoological Journal of the Linnean Society* 64: 293–326. <https://doi.org/10.1111/j.1096-3642.1978.tb01075.x>
- Andrietti F (2011) The art of managing weapons: the stinging behavior of solitary wasps in the eyes of past, present and future research. In: Polidori C (Ed.) *Predation in the Hymenoptera: an evolutionary perspective*. Transworld Research Network (Trivandrum): 123–198. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Andrietti_2011.pdf
- Antropov AV (1994) A review of the *agile* species group of *Pison* (Hymenoptera: Sphecidae: Trypoxylini). *Journal of Hymenoptera Research* 3: 119–132. <http://biodiversitylibrary.org/page/2867739>
- Antropov AV (2003) [2002] On the occurrence of *Trypoxylon attenuatum* F. Smith, 1951 [*sic*] (Hymenoptera: Crabronidae: Trypoxylini) in North America. *Russian Entomological Journal* 11: 437–439. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Antropov_2003_Trypoxylon_attenuatum_N_America.pdf
- Ashmead WH (1896) The phylogeny of the Hymenoptera. *Proceedings of the Entomological Society of Washington* 3: 323–336. <https://www.biodiversitylibrary.org/page/2360632>
- Atlas of Canada [1st edn] (1906) Isotherms for summer and year, rainfall, snowfall and isobars. https://ftp.geogratis.gc.ca/pub/nrcan_rncan/raster/atlas_1_ed/eng/environment/climate/page26.pdf [Access: 3 December 2024]
- Banks N (1921) New Nearctic fossorial Hymenoptera. *Annals of the Entomological Society of America* 14: 16–26. <https://doi.org/10.1093/aesa/14.1.16>
- Beggs JR, Brockerhoff EG, Corley JC, Kenis M, Masciocchi M, Muller F, Rome Q, Villemant C (2011) Ecological effects and management of invasive alien Vespidae. *BioControl* 56: 505–526. <https://doi.org/10.1007/s10526-011-9389-z>
- Belokobylskij SA, Lelej AS (Eds) (2017) Annotated catalogue of the Hymenoptera of Russia. Volume I, Symphyta and Apocrita: Aculeata. *Proceedings of the Zoological Institute of the Russian Academy of Sciences. Supplement 6. Zoological Institute RAS (St. Petersburg)*, 1–475. <https://doi.org/10.31610/trudyzin/2017.supl.6.5>
- Bennett AMR (2021) Checklists of the Hymenoptera of Canada, Alaska and Greenland – Introduction. *Journal of Hymenoptera Research* 82: 1–19. <https://doi.org/10.3897/jhr.82.60054>
- Bennett AMR (2024) Checklist of the Hymenoptera of Canada, Alaska and Greenland. Checklist dataset. Agriculture and Agri-Food Canada. Canadensys repository: Datasets published by the participants of the Canadensys network. <https://doi.org/10.5886/4piso5> [Access: 3 December 2024]
- Bennett AMR, Sheffield CS, de Waard JM (2019) Hymenoptera of Canada. *ZooKeys* 819: 311–360. <https://doi.org/10.3897/zookeys.819.28510>
- Bennett AMR, Buffington ML, Deans AR, Forshage M, Melika G, Mikó I, Smith DR (2024) Checklists of the Ceraphronoidea, Cynipoidea, Evanioidea, Stephanoidea and Trigonalioidea (Hymenoptera) of Canada, Alaska, and Greenland. *Journal of Hymenoptera Research* 97: 1163–1220. <https://doi.org/10.3897/jhr.97.130428>

- Bizecki Robson D (2014) Mutualistic and antagonistic networks involving the rare silky prairie-clover (*Dalea villosa* var. *villosa*) and its co-flowering plants and insect visitors. *Botany* 92: 47–58. <https://doi.org/10.1139/cjb-2013-0231>
- Blades DCA, Maier CW (1996) A survey of grassland and montane arthropods collected in the southern Okanagan region of British Columbia. *Journal of the Entomological Society of British Columbia* 93: 49–73. <https://journal.entsocbc.ca/index.php/journal/article/view/523>
- Bohart GE, Bohart RM (1966) A revision of the genus *Larropsis* Patton (Hymenoptera: Sphecidae). *Transactions of the American Entomological Society* 92: 653–685. <https://www.jstor.org/stable/25077926>
- Bohart RM (1968) A synopsis of the American species of the genus *Oryttus* (Hymenoptera, Sphecidae). *Proceedings of the Biological Society of Washington* 81: 431–437. <https://www.biodiversitylibrary.org/page/34605976>
- Bohart RM (1969) New species of *Pseudoplisus* from North and Central America. I: the *P. phaleratus* group (Hymenoptera: Sphecidae). *Journal of the Kansas Entomological Society* 41: 494–501. <https://www.jstor.org/stable/25083742>
- Bohart RM (1971) New species of Gorytini from western North America (Hymenoptera: Sphecidae). *Proceedings of the Biological Society of Washington* 83: 445–454. <https://www.biodiversitylibrary.org/page/34573089>
- Bohart RM (1974) A review of the genus *Rhopalum* in America north of Mexico (Hymenoptera: Sphecidae). *Journal of the Georgia Entomological Society* 9: 252–260. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Bohart_R_1974_Rhopalum.pdf
- Bohart RM (1976) A review of the Nearctic species of *Crabro* (Hymenoptera: Sphecidae). *Transactions of the American Entomological Society* 102: 229–287. <https://www.jstor.org/stable/25078192>
- Bohart RM (1980) A review of the North American species of *Dienoplus* (Hymenoptera, Sphecidae). *The Pan-Pacific Entomologist* 56: 63–70. <https://www.biodiversitylibrary.org/page/56105294>
- Bohart RM (1991) [1990] New species and a key to North American *Solierella* in the *inermis* group (Hymenoptera: Sphecidae: Larrinae: Miscophini). *Psyche* 97: 229–240. <https://doi.org/10.1155/1990/68565>
- Bohart RM (1993) Notes on *Microbembex* with new species from Texas, Mexico, and El Salvador (Hymenoptera, Sphecidae, Nyssoninae). *Journal of the Kansas Entomological Society* 66: 274–279. <https://www.jstor.org/stable/25085449>
- Bohart RM (1994a) A key to the genus *Tachytes* in America north of Mexico with descriptions of three new species (Hymenoptera, Sphecidae, Larrinae). *Proceedings of the Entomological Society of Washington* 96: 342–349. <http://biodiversitylibrary.org/page/16151752>
- Bohart RM (1994b) A review of North American *Belomicrus* (Hymenoptera, Sphecidae, Crabroninae). *Journal of Hymenoptera Research* 3: 207–226. <http://biodiversitylibrary.org/page/2867827>
- Bohart RM (1996) A review of the genus *Bicyrtes* (Hymenoptera: Sphecidae, Nyssoninae, Bembicini). *Insecta Mundi* 10: 139–152. <https://journals.flvc.org/mundi/article/view/24825/24156>

- Bohart RM (1997) A review of the genus *Hoplisoides* Gribodo (Hymenoptera: Sphecidae: Gorytini) in North America. *Proceedings of the Entomological Society of Washington* 99: 645–660. <https://www.biodiversitylibrary.org/page/16213320>
- Bohart RM (2000) A review of Gorytini in the Neotropical Region (Hymenoptera: Sphecidae: Bembicinae). *Contributions on Entomology, International* 4: 111–259. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Bohart_2000_Gorytini.pdf
- Bohart RM, Bohart GE (1962) A revision of the *Larropsis* subgenus *Ancistromma* Fox (Hymenoptera: Sphecidae). *Proceedings of the Entomological Society of Washington* 64: 21–37. <https://www.biodiversitylibrary.org/page/16339132>
- Bohart RM, Gillaspay JE (1985) California sand wasps of the subtribe Stictiellina. *Bulletin of the California Insect Survey* 27: i–vi, 1–89. <http://essig.berkeley.edu/documents/cis/cis27.pdf>
- Bohart RM, Grissell EE (1975) California wasps of the subfamily Philanthinae (Hymenoptera: Sphecidae). *Bulletin of the California Insect Survey* 19: 1–92. <https://essig.berkeley.edu/documents/cis/cis19.pdf>
- Bohart RM, Horning DS (1971) California bembicine sand wasps. *Bulletin of the California Insect Survey* 13: 1–49. <http://essig.berkeley.edu/documents/cis/cis13.pdf>
- Bohart RM, Kimsey LS (1979) A key to the species of *Ectemnius* in America north of Mexico with notes and description of a new species (Hymenoptera: Sphecidae). *Proceedings of the Entomological Society of Washington* 81: 486–498. <https://www.biodiversitylibrary.org/page/25209337>
- Bohart RM, Menke AS (1963) A reclassification of the Sphecinae with a revision of the Nearctic species of the tribes Sceliphronini and Sphecini (Hymenoptera, Sphecidae). *University of California Publications in Entomology* Vol. 30. University of California Press (Berkeley, Los Angeles), 91–182. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Bohart_&_Menke_1963.pdf
- Bohart RM, Menke AS (1976) Sphecid wasps of the world. A generic revision. University of California Press (Berkeley, Los Angeles, London): i–ix, 1–695. <https://doi.org/10.1525/9780520309548>
- Bohart RM, Schlinger EI (1957) California wasps of the genus *Oxybelus* (Hymenoptera, Sphecidae, Crabroninae). *Bulletin of the California Insect Survey* 4: 103–134. https://essig.berkeley.edu/documents/cis/cis04_4.pdf
- Bohart RM, Smith NJ (1978) A revision of Nearctic *Ammoplanops* (Hymenoptera, Sphecidae). *Journal of the Kansas Entomological Society* 51: 75–90. <https://www.jstor.org/stable/25083004>
- Bohart RM, Smith NJ (1995) [1994] Contributions to the knowledge of the genus *Spilomena* Shuckard in America north of Mexico (Hymenoptera, Sphecidae, Pemphredoninae). *Journal of the Kansas Entomological Society* 67: 318–330. <https://www.jstor.org/stable/25085537>
- BOLD (2010a) *Stigmus americanus* [Newfoundland, BIObus 2009]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=BBHYE424-10 [Access: 29 November 2024]
- BOLD (2010b) *Psenulus pallipes* [Nova Scotia, BIObus 2009]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=BBHEC732-10 [Access: 29 November 2024]
- BOLD (2010c) *Psenulus trisulcus* [Nova Scotia, BIObus 2009]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=BBHYF250-10 [Access: 29 November 2024]

- BOLD (2011) *Passaloecus eremita* [Ontario, Paul Hebert]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=PHMTX534-11 [Access: 29 November 2024]
- BOLD (2013a) *Crossocerus maculipennis* [Nova Scotia, Tyler Zemlak]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=HPPPD1762-13 [Access: 29 November 2024]
- BOLD (2013b) *Passaloecus singularis* [Nova Scotia, Tyler Zemlak]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=HPPPB018-13 [Access: 29 November 2024]
- BOLD (2014a) *Rhopalum clavipes* [New Brunswick, Shirley Butland]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=CNFDE038-14 [Access: 29 November 2024]
- BOLD (2014b) *Rhopalum clavipes* [Prince Edward Island, Paul Ayles]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=CNPEG004-14 [Access: 29 November 2024]
- BOLD (2014c) *Stigmus fulvicornis* [Quebec, Dany Brodeur]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=CNFNG1204-14 [Access: 29 November 2024]
- BOLD (2016a) *Lestiphorus piceus* [Yukon Territory, Mary Whitley]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=GMOTE086-15 [Access: 29 November 2024]
- BOLD (2016b) *Stigmus americanus* [Yukon Territory, BIObus 2014]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=SSKUA12186-15 [Access: 29 November 2024]
- BOLD (2024a) *Crabro maeklini* [Nunavut, K. Perez, V. Levesque-Beaudin]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=FCHAR2734-19 [Access: 29 November 2024]
- BOLD (2024b) *Rhopalum clavipes* [Yukon Territory, Syd Cannings]. https://v4.boldsystems.org/index.php/Public_RecordView?processid=AMCAO060-20 [Access: 29 November 2024]
- BOLD (2024c) The Barcode of Life Data System. Boldsystems public data portal. https://v4.boldsystems.org/index.php/Public_BINSearch?searchtype=records [Access: 29 November 2024]
- Branstetter MG, Danforth BN, Pitts JP, Faircloth BC, Ward PS, Buffington ML, Gates MW, Kula RR, Brady SG (2017) Phylogenomic insights into the evolution of stinging wasps and the origins of ants and bees. *Current Biology* 27: 1019–1025. <https://doi.org/10.1016/j.cub.2017.03.027>
- Brock RE, Cini A, Sumner S (2021) Ecosystem services provided by aculeate wasps. *Biological Reviews* 96: 1645–1675. <https://doi.org/10.1111/brv.12719>
- Buck M (2004) [2003] An annotated checklist of the spheciform wasps of Ontario (Hymenoptera: Ampulicidae, Sphecidae and Crabronidae). *Journal of the Entomological Society of Ontario* 134: 19–84. https://www.entsocont.ca/uploads/3/0/2/6/30266933/134_19_84.pdf
- Buck M (2005) Two introduced spider wasps (Hymenoptera: Pompilidae) new to Canada, with notes on nesting habits and the incidence of introductions. *The Canadian Entomologist* 137: 278–282. <https://doi.org/10.4039/n04-107>
- Buck M (2007) [2006] Review of the Canadian species of *Hoplisoides* (Hymenoptera: Crabronidae) with revisionary notes on the *H. placidus* species group. *Journal of the Entomological Society of Ontario* 137: 63–79. https://www.entsocont.ca/uploads/3/0/2/6/30266933/137_63_79.pdf
- Buck M, Cobb TP, Stahlhut JK, Hanner RH (2012) Unravelling cryptic species diversity in eastern Nearctic paper wasps, *Polistes* (*Fuscopolistes*), using male genitalia, morphometrics and DNA barcoding, with descriptions of two new species (Hymenoptera: Vespidae). *Zootaxa* 3502: 1–48. <https://doi.org/10.11646/zootaxa.3502.1.1>

- Buck M, Paiero SM, Marshall SA (2006) [2005] New records of native and introduced aculeate Hymenoptera from Ontario, with keys to eastern Canadian species of *Cerceris* (Crabronidae) and eastern Nearctic species of *Chelostoma* (Megachilidae). Journal of the Entomological Society of Ontario 136: 37–52. https://www.entsocont.ca/uploads/3/0/2/6/30266933/136_37_52.pdf
- BugGuide (2008) *Chalybion californicum* [Prince Edward Island, Christopher Adam]. <https://bugguide.net/node/view/174338> [Access: 29 November 2024]
- BugGuide (2010) *Isodontia mexicana* [California, Arthur Scott Macmillan]. <https://bugguide.net/node/view/465793> [Access: 29 November 2024]
- BugGuide (2013a) *Bicyrtes quadrifasciatus* [Quebec, Jean Brodeur]. <https://bugguide.net/node/view/814445> [Access: 29 November 2024]
- BugGuide (2013b) *Crabro argusinus* [New Brunswick, Stuart Tingley]. <https://bugguide.net/node/view/811505> [Access: 29 November 2024]
- BugGuide (2013c) *Tachysphex terminatus* [New Brunswick, Stuart Tingley] <https://bugguide.net/node/view/845288> [Access: 29 November 2024]
- BugGuide (2013d) *Cerceris atramontensis* [New Brunswick, Stuart Tingley]. <https://bugguide.net/node/view/836662> [Access: 29 November 2024]
- BugGuide (2013e) *Sceliphron curvatum* [Quebec, Latour]. <https://bugguide.net/node/view/800551> [Access: 29 November 2024]
- BugGuide (2013f) *Prionyx parkeri* [New Brunswick, Stuart Tingley]. <https://bugguide.net/node/view/821863> [Access: 29 November 2024]
- BugGuide (2014a) *Saygorytes phaleratus* [New Brunswick, Stuart Tingley]. <https://bugguide.net/node/view/965172> [Access: 29 November 2024]
- BugGuide (2014b) *Rhopalum coarctatum* [New Brunswick, Richard Migneault]. <https://bugguide.net/node/view/881077> [Access: 29 November 2024]
- BugGuide (2014c) *Philanthus solivagus* [New Brunswick, Stuart Tingley]. <https://bugguide.net/node/view/980992> [Access: 29 November 2024]
- BugGuide (2014d) *Chalybion californicum* [Nova Scotia, Angus MacLean]. <https://bugguide.net/node/view/896374> [Access: 29 November 2024]
- BugGuide (2018) *Crossocerus binotatus* [Quebec, Leo-Guy de Repentigny]. <https://bugguide.net/node/view/1529764> [Access: 29 November 2024]
- BugGuide (2019a) *Alysson triangulifer* [New Brunswick, Richard Migneault]. <https://bugguide.net/node/view/1644323> [Access: 29 November 2024]
- BugGuide (2019b) *Philanthus gibbosus* [New Brunswick, Stuart Tingley] <https://bugguide.net/node/view/1640832> [Access: 29 November 2024]
- Burns JM, Janzen DH, Hajibabaei ME, Hallwachs WI, Hebert PD (2007) DNA barcodes of closely related (but morphologically and ecologically distinct) species of skipper butterflies (Hesperiidae) can differ by only one to three nucleotides. Journal of the Lepidopterists Society 61(3): 138–153. [https://images.peabody.yale.edu/lepsoc/jls/2000s/2007/2007\(3\)137-Burns.pdf](https://images.peabody.yale.edu/lepsoc/jls/2000s/2007/2007(3)137-Burns.pdf)
- Callaghan CT, Mesaglio T, Ascher JS, Brooks TM, Cabras AA, Chandler M, et al. (2022) The benefits of contributing to the citizen science platform iNaturalist as an identifier. PLOS Biology 20(11): e3001843 (6 pp.). <https://doi.org/10.1371/journal.pbio.3001843>

- Callaghan CT, Ozeroff I, Hitchcock C, Chandler M (2020) Capitalizing on opportunistic citizen science data to monitor urban biodiversity: A multi-taxa framework. *Biological Conservation* 251: 251108753. <https://doi.org/10.1016/j.biocon.2020.108753>
- Cameron SA, Lozier JD, Strange JP, Koch JB, Cordes N, Solter LF, Griswold TL (2011) Patterns of widespread decline in North American bumble bees. *Proceedings of the National Academy of Sciences* 108(2): 662–667. www.pnas.org/cgi/doi/10.1073/pnas.1014743108
- Carpenter JM, Glare TR (2010) Misidentification of *Vespula alascensis* as *V. vulgaris* in North America (Hymenoptera: Vespidae; Vespinae). *American Museum Novitates* 3690: 1–7. <https://doi.org/10.1206/706.1>
- Carter W (1925) Records of Alberta Sphecoidea with descriptions of new species of Crabronidae. *The Canadian Entomologist* 57: 131–136. <https://doi.org/10.4039/Ent57131-6>
- Coelho JR (2011) Effects of prey size and load carriage on the evolution of foraging strategies in wasps. In: Polidori C (Ed.) *Predation in the Hymenoptera: an evolutionary perspective*. Transworld Research Network (Trivandrum): 23–37. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Coelho_2011_preysize_2.pdf
- Colla SR, Gadallah F, Richardson L, Wagner D, Gall L (2012) Assessing declines of North American bumble bees (*Bombus* spp.) using museum specimens. *Biodiversity and Conservation* 21: 3585–3595. <https://doi.org/10.1007/s10531-012-0383-2>
- Colla SR, Packer L (2008) Evidence for decline in eastern North American bumblebees (Hymenoptera: Apidae), with special focus on *Bombus affinis* Cresson. *Biodiversity and Conservation* 17: 1379–1391. <https://doi.org/10.1007/s10531-008-9340-5>
- Coville RE (1982) Wasps of the genus *Trypoxylon* subgenus *Trypargilum* in North America. University of California Publications in Entomology, Vol. 97. University of California Press (Berkeley, Los Angeles, London), 1–147. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Coville_1982b.pdf
- Coville RE (1984) The occurrence of *Trypoxylon clavicerum* in North America (Hymenoptera: Sphecidae). *The Pan-Pacific Entomologist* 60: 256–257. <https://www.biodiversitylibrary.org/page/56448687>
- Cresson ET (1887) Synopsis of the families and genera of the Hymenoptera of America north of Mexico, together with a catalogue of the described species and bibliography. *Transactions of the American Entomological Society*, Supplementary volume: vi + 351 pp. <https://doi.org/10.5962/bhl.title.5531>
- Danks HV, Downes JA, Larson DJ, Scudder GGE (1997) Insects of the Yukon: characteristics and history. In: Danks HV, Downes JA (Eds) *Insects of the Yukon*. Biological Survey of Canada (Ottawa): 963–1013. <https://biologicalsurvey.ca/scientific-monographs/> [Access: 7 February 2025]
- Debevec AH, Cardinal S, Danforth BN (2012) Identifying the sister group to the bees: a molecular phylogeny of Aculeata with an emphasis on the superfamily Apoidea. *Zoologica Scripta* 41: 527–535. <https://doi.org/10.1111/j.1463-6409.2012.00549.x>
- Dollfuss H (1995) A worldwide revision of *Pemphredon* Latreille 1796 (Hymenoptera, Sphecidae). *Linzer Biologische Beiträge* 27: 905–1019. https://www.zobodat.at/pdf/LBB_0027_2_0905-1019.pdf

- Eighme LE (1989) Revision of *Diodontus* (Hymenoptera: Sphecidae) in America north of Mexico. *Annals of the Entomological Society of America* 82: 14–28. <https://doi.org/10.1093/aesa/82.1.14>
- Elliot NB, Kurczewski FE (1973) Northern distribution records for several Sphecidae and Pompilidae (Hymenoptera). *Journal of the New York Entomological Society* 81: 79–80. <https://www.biodiversitylibrary.org/page/50812527>
- Evans HE (1962) The evolution of prey-carrying mechanism in wasps. *Evolution* 16: 468–483. <https://doi.org/10.2307/2406179>
- Evans HE (1965) Simultaneous care of more than one nest by *Ammophila azteca* Cameron (Hymenoptera, Sphecidae). *Psyche* 72: 8–23. <https://www.biodiversitylibrary.org/page/50935467>
- Evans HE (1966) The comparative ethology and evolution of the sand wasps. Harvard University Press (Cambridge, Massachusetts): i–xvi, 1–526. <https://doi.org/10.4159/harvard.9780674333369>
- Evans HE (1974) Digger wasps as colonizers of new habitat (Hymenoptera: Aculeata). *Journal of the New York Entomological Society* 82: 259–267. <https://www.biodiversitylibrary.org/page/50819635>
- Evans HE, Matthews RW (1968) North American *Bembix*, a revised key and suggested grouping. *Annals of the Entomological Society of America* 61: 1284–1299. <https://doi.org/10.1093/aesa/61.5.1284>
- Evans HE, O'Neill KM (2007) The sand wasps. Natural history and behavior. Harvard University Press (Cambridge, Massachusetts; London, England): i–ix, 1–340. <https://doi.org/10.4159/9780674036611-prf>
- Fateryga AV (2022) Revision of the *Pseudepipona herrichii*-group of the eumenine wasps (Hymenoptera: Vespidae: Eumeninae) with the description of two new species from China and Russia. *Zootaxa* 5154: 101–126. <https://doi.org/10.11646/zootaxa.5154.2.1>
- Fateryga AV, Carpenter JM, Fateryga VV (2023) *Ancistrocerus capra* (De Saussure, 1857), a valid species, not a synonym of *A. antilope* (Panzer, 1798) (Hymenoptera: Vespidae: Eumeninae). *American Museum Novitates* 4002: 1–16. <https://doi.org/10.1206/4002.1>
- Ferguson GR (1983a) Two new species in the genus *Philanthus* and a key to the *politus* group (Hymenoptera: Philanthidae). *Pan-Pacific Entomologist* 59: 55–63. <https://www.biodiversitylibrary.org/page/56199193>
- Ferguson GR (1983b) Two new species and synonymy of three species of North American *Cerceris* (Hymenoptera: Philanthidae). *Journal of the New York Entomological Society* 91: 235–241. <https://www.biodiversitylibrary.org/page/50780270>
- Ferguson GR (1984a) [1983] Revision of the *Philanthus zebratus* group (Hymenoptera: Philanthidae). *Journal of the New York Entomological Society* 91: 289–303. <https://www.biodiversitylibrary.org/page/50780328>
- Ferguson GR (1984b) [1983] An annotated synonymic list of North American and Caribbean Wasps of the genus *Cerceris* (Hymenoptera: Philanthidae). *Journal of the New York Entomological Society* 91: 466–502. <https://www.biodiversitylibrary.org/page/50780505>
- Finnamore AT (1982) The Sphecoidea of southern Quebec (Hymenoptera). *Memoir of the Lyman Entomological Museum and Research Laboratory* 11: 1–348. <https://books.google.ca/books?id=j-JMAAAAYAAJ>

- Finnamore AT (1983) Revision of the American species of *Mimesa* (Hymenoptera: Sphecidae: Pseninae). Memoir of the Lyman Entomological Museum and Research Laboratory 12: 1–171. <https://books.google.ca/books?id=PkJwQEACAAJ>
- Finnamore AT (1988) A new species of *Crabro* from arctic Yukon (Hymenoptera: Sphecoidea: Crabronidae). The Canadian Entomologist 120: 859–865. <https://doi.org/10.4039/Ent120859-10>
- Finnamore AT (1994) Hymenoptera of the Wagner Natural Area, a boreal spring fen in central Alberta. Memoirs of the Entomological Society of Canada 169: 181–220. <https://doi.org/10.4039/entm126169181-1>
- Finnamore AT (1997) Aculeate wasps (Hymenoptera: Aculeata) of the Yukon, other than Formicidae. In: Danks HV, Downes JA (Eds) Insects of the Yukon. Biological Survey of Canada (Ottawa), 868–900. <https://biologicalsurvey.ca/scientific-monographs/> [Access: 7 February 2025]
- Finnamore AT, Buckle D (1999) Arthropod component report. The stinging wasps (Hymenoptera: Chrysidoidea, Vespoidea, Apoidea) and spiders (Araneae). Canadian Forces Base Suffield National Wildlife Area. Wildlife inventory. Canadian Wildlife Service, Environment Canada, Prairie and Northern Region (Edmonton), i–vii, 1–197. https://publications.gc.ca/collections/collection_2020/eccc/cw66/CW66-625-1999-eng.pdf
- Fox WJ (1891) On the species of *Trypoxylon* inhabiting America north of Mexico. Transactions of the American Entomological Society 18: 136–148, [pl. III]. <http://biodiversitylibrary.org/page/7524561>
- Fox WJ (1894a) [1893] The North American Larridae. Proceedings of the Academy of Natural Sciences of Philadelphia 1893: 467–551. <http://biodiversitylibrary.org/page/1633620>
- Fox WJ (1894b) Studies among the fossorial Hymenoptera. – I. Synopsis of the North American species of *Alyson* [sic!]. Entomological News 5: 86–89. <http://biodiversitylibrary.org/page/24654174>
- Fox WJ (1895) The Crabroninae of Boreal America. Transactions of the American Entomological Society 22: 129–226. <http://biodiversitylibrary.org/page/7521454>
- Gahan AB, Rohwer SA (1917) Lectotypes of the species of Hymenoptera (except Apoidea) described by Abbé Provancher. The Canadian Entomologist 49: 298–308. <https://doi.org/10.4039/Ent49298-9>
- Gargominy O, Tercerie S, Régnier C, Dupont P, Daszkiewicz P, Antonetti P, Léotard G, Ramage T, Idczak L, Vandel E, Petitteville M, Leblond S, Bouillet V, Denys G, De Massary JC, Dusoulier F, Lévêque A, Jourdan H, Touroult J, Rome Q, Le Divelec R, Simian G, Savouré-Soubelet A, Page N, Barbut J, Canard A, Haffner P, Meyer C, Van Es J, Poncet R, Demerges D, Mehran B, Horellou A, Ah-Peng C, Bernard J-F, Bounias-Delacour A, Caesar M, Comolet-Tirman J, Courtecuisse R, Delfosse E, Dewynter M, Hugonnot V, Lavocat Bernard E, Lebouvier M, Lebreton E, Malécot V, Moreau PA, Moulin N, Muller S, Noblecourt T, Pellens R, Thouvenot L, Tison JM, Robbert Gradstein S, Rodrigues C, Rouhan G, Véron S (2021) Référentiel taxonomique: Faune, flore et fonge de France métropolitaine et d’outre-mer, TAXREF v15.0. UMS PatriNat, Muséum national d’Histoire naturelle (Paris). <https://inpn.mnhn.fr/telechargement/referentielEspece/taxref/15.0/menu> [Access: 3 December 2024]

- Gibbs J (2018) DNA barcoding a nightmare taxon: assessing barcode index numbers and barcode gaps for sweat bees. *Genome* 61(1): 21–31. <https://doi.org/10.1139/gen-2017-0096>
- Gibbs J, Packer L, Dumesh S, Danforth BN (2013) Revision and reclassification of *Lasioglossum* (*Evylaeus*), *L. (Hemihalictus)* and *L. (Sphecodogastra)* in eastern North America (Hymenoptera: Apoidea: Halictidae). *Zootaxa* 3672: 1–117. <https://doi.org/10.11646/zootaxa.3672.1.1>
- Gittins AR (1963) Revision of the species of Psenini in America north of Mexico. PhD thesis, Montana State College (Bozeman), 1–275. <https://scholarworks.montana.edu/items/9b4375b8-b1a8-4caf-8001-32e0de1a8d05>
- González-Vaquero RA, Roig-Alsina A, Packer L (2016) DNA barcoding as a useful tool in the systematic study of wild bees of the tribe Augochlorini (Hymenoptera: Halictidae). *Genome* 59(10): 889–898. <https://doi.org/10.1139/gen-2016-0006>
- Goulet H, Bennett AMR (2021) Checklist of the sawflies (Hymenoptera) of Canada, Alaska and Greenland. *Journal of Hymenoptera Research* 82: 21–67. <https://doi.org/10.3897/jhr.82.60057>
- Government of Canada (2024) Forest classification: Canada's forest regions. https://natural-resources.canada.ca/sites/nrcan/files/forest/SFM/classification/Canada_forest_regions.pdf [Access: 3 December 2024]
- Haberski A, Woller DA, Sikes DS (2021) Orthoptera of Alaska: A photographic key, new records, and synonym of *Melanoplus gordonae*. *Canadian Journal of Arthropod Identification* 44: 1–51. <https://doi.org/10.3752/cjai.2021.44>
- Harrington WH (1902) Fauna Ottawaensis – Hymenoptera – Superfamily II. – Sphegoidea. *The Ottawa Naturalist* 15: 215–224. <https://www.biodiversitylibrary.org/page/30217482>
- Heneberg P, Bogusch P, Řehouněk J (2013) Sandpits provide critical refuge for bees and wasps (Hymenoptera: Apocrita). *Journal of Insect Conservation* 17: 473–490. <https://doi.org/10.1007/s10841-012-9529-5>
- Hilchie GJ (1982) Evolutionary aspects of geographic variation in color and of prey in the beewolf species *Philanthus albopilosus* Cresson. *Quaestiones Entomologicae* 18: 91–126. <https://www.biodiversitylibrary.org/page/51326914>
- Holliday CW, Coelho JR (2006) Improved key to New World species of *Sphecius* (Hymenoptera: Crabroninae). *Annals of the Entomological Society of America* 99: 793–798. [https://doi.org/10.1603/0013-8746\(2006\)99\[793:IKTNWS\]2.0.CO;2](https://doi.org/10.1603/0013-8746(2006)99[793:IKTNWS]2.0.CO;2)
- Holm H (2021) Wasps: their biology, diversity, and role as beneficial insects and pollinators of native plants. Pollination Press LLC (Minnetonka, Minnesota), 1–415. <https://www.pollinationpress.com/store/p17/wasps.html> [Access: 7 February 2025]
- Huber JT (2017) Chapter 12. Biodiversity of Hymenoptera. In: Footitt RG, Adler PH (Eds) *Insect biodiversity: science and society* (2nd edn). Wiley-Blackwell (Oxford): 419–61. <https://doi.org/10.1002/9781118945568.ch12>
- Huber JT, Bennett AMR, Gibson GAP, Zhang YM, Darling DC (2021) Checklist of Chalcidoidea and Mymarommatoidea (Hymenoptera) of Canada, Alaska and Greenland. *Journal of Hymenoptera Research* 82: 69–138. <https://doi.org/10.3897/jhr.82.60058>
- iNaturalist (2016) *Sceliphron caementarium*, [South Korea, Paul B. <whaichi>] <https://www.inaturalist.org/observations/3322346> [Access: 29 November 2024]
- iNaturalist (2017) *Sphex ichneumoneus* [Manitoba, Morag Schonken <moragschonken>]. <https://www.inaturalist.org/observations/7743469> [Access: 29 November 2024]

- iNaturalist (2018a) *Nysson plagiat* [Ontario, Karen Yukich <kyukich>]. <https://www.inaturalist.org/observations/14391447> [Access: 29 November 2024]
- iNaturalist (2018b) *Isodontia mexicana* [Oregon, Mark Nikas <elepaio>]. <https://www.inaturalist.org/observations/18999534> [Access: 29 November 2024]
- iNaturalist (2018c) *Isodontia mexicana* [Washington, <jenstr>]. <https://www.inaturalist.org/observations/15403057> [Access: 29 November 2024]
- iNaturalist (2018d) *Isodontia mexicana* [British Columbia, <y-zhou>]. <https://www.inaturalist.org/observations/14650065> [Access: 29 November 2024]
- iNaturalist (2019a) *Bicyrtes ventralis* [New Brunswick, Jimmy Dee <jdee>]. <https://www.inaturalist.org/observations/30775044> [Access: 29 November 2024]
- iNaturalist (2019b) *Crossocerus barbipes* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/37527564> [Access: 29 November 2024]
- iNaturalist (2019c) *Ectemnius cephalotes* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/32665516> [Access: 29 November 2024]
- iNaturalist (2019d) *Ectemnius cephalotes* [Newfoundland, <c704938>]. <https://www.inaturalist.org/observations/31846565> [Access: 29 November 2024]
- iNaturalist (2019e) *Ectemnius trifasciatus* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/30531432> [Access: 29 November 2024]
- iNaturalist (2019f) *Larropsis distincta* [New Brunswick, Syd Cannings <sydcannings>]. <https://www.inaturalist.org/observations/31031040> [Access: 29 November 2024]
- iNaturalist (2019g) *Ammophila procera* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/20968799> [Access: 29 November 2024]
- iNaturalist (2019h) *Ammophila procera* [Quebec, David Turgeon <david_turgeon>]. <https://www.inaturalist.org/observations/19737896> [Access: 29 November 2024]
- iNaturalist (2019i) *Eremnophila aureonotata* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/8069419> [Access: 29 November 2024]
- iNaturalist (2019j) *Eremnophila aureonotata* [Prince Edward Island, Robert W. Harding <bobharding>]. <https://www.inaturalist.org/observations/29879510> [Access: 29 November 2024]
- iNaturalist (2019k) *Sceliphron caementarium* [New Caledonia, <juju98>]. <https://www.inaturalist.org/observations/36388191> [Access: 29 November 2024]
- iNaturalist (2020a) *Hoplisoides nebulosus* [Nova Scotia, Nick Belliveau <nickbelliveau>]. <https://www.inaturalist.org/observations/57457667> [Access: 29 November 2024]
- iNaturalist (2020b) *Foxia* sp. [British Columbia, Gord Hutchings <gordhutchings>]. <https://www.inaturalist.org/observations/56875476> [Access: 29 November 2024]
- iNaturalist (2020c) *Crossocerus nitidiventris* [New Brunswick, Gail Taylor <nubiti>]. <https://www.inaturalist.org/observations/51545909> [Access: 29 November 2024]
- iNaturalist (2020d) *Sceliphron caementarium* [Canary Islands, <gabohq>]. <https://www.inaturalist.org/observations/37636096> [Access: 29 November 2024]
- iNaturalist (2020e) *Ectemnius stirpicola* [Nova Scotia, David McCorquodale <dbmcc09>]. <https://www.inaturalist.org/observations/54109356> [Access: 29 November 2024]
- iNaturalist (2020f) *Cerceris clypeata* [Quebec, Alain Hogue <alainhogue>]. <https://www.inaturalist.org/observations/61165348> [Access: 29 November 2024]
- iNaturalist (2020g) *Cerceris fumipennis* [Quebec, <thejasperpatch>]. <https://www.inaturalist.org/observations/54737365> [Access: 29 November 2024]

- iNaturalist (2020h) *Philanthus ventilabris* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/55897732> [Access: 29 November 2024]
- iNaturalist (2020i) *Prionyx parkeri* [Quebec, Suzanne Labbé <suelabbe>]. <https://www.inaturalist.org/observations/49877892> [Access: 29 November 2024]
- iNaturalist (2020j) *Isodontia mexicana* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/58138410> [Access: 29 November 2024]
- iNaturalist (2020k) *Tachytes mergus* [Ontario, Owen Strickland <owenstrickland>]. <https://www.inaturalist.org/observations/56277584> [Access: 29 November 2024]
- iNaturalist (2020l) *Tachytes obductus* [Ontario, Owen Strickland <owenstrickland>]. <https://www.inaturalist.org/observations/54689518> [Access: 29 November 2024]
- iNaturalist (2020m) *Bembix pallidipicta* [Ontario, Owen Strickland <owenstrickland>]. <https://www.inaturalist.org/observations/54576145> [Access: 29 November 2024]
- iNaturalist (2020n) *Lestiphorus cockerelli* [Ontario, Riley Walsh <rileywalsh>]. <https://www.inaturalist.org/observations/56371326> [Access: 29 November 2024]
- iNaturalist (2020o) *Stictiella emarginata* [Ontario, Dave Beadle <dbeadle>]. <https://www.inaturalist.org/observations/39329742> [Access: 29 November 2024]
- iNaturalist (2020p) *Tachytes intermedius* [Ontario, Owen Strickland <owenstrickland>]. <https://www.inaturalist.org/observations/54126827> [Access: 29 November 2024]
- iNaturalist (2020q) *Philanthus sanbornii* [Ontario, Riley Walsh <rileywalsh>]. <https://www.inaturalist.org/observations/51649920> [Access: 29 November 2024]
- iNaturalist (2020r) *Eremnophila aureonotata* [Quebec, Mathis Boisvert <mathisb21>]. <https://www.inaturalist.org/observations/53265173> [Access: 29 November 2024]
- iNaturalist (2020s) *Sceliphron caementarium* [Oman, <suvijohn>]. <https://www.inaturalist.org/observations/47609817> [Access: 29 November 2024]
- iNaturalist (2021a) *Argogorytes nigrifrons* [Prince Edward Island, Barry Cottam <pei-ott>]. <https://www.inaturalist.org/observations/102383030> [Access: 29 November 2024]
- iNaturalist (2021b) *Crossocerus maculipennis* [Yukon Territory, Evan Warren <ewren>]. <https://www.inaturalist.org/observations/88088494> [Access: 29 November 2024]
- iNaturalist (2021c) *Ectemnius cephalotes* [Nova Scotia, <ipat>]. <https://www.inaturalist.org/observations/87471189> [Access: 29 November 2024]
- iNaturalist (2021d) *Larropsis distincta* [Nova Scotia, <grivesolitair>]. <https://www.inaturalist.org/observations/89582896> [Access: 29 November 2024]
- iNaturalist (2021e) *Trypoxylon lactitarse* [Quebec, Frederic Desmeules <freduchini>]. <https://www.inaturalist.org/observations/91175927> [Access: 29 November 2024]
- iNaturalist (2021f) *Cerceris atramontensis* [Prince Edward Island, Barry Cottam <pei-ott>]. <https://www.inaturalist.org/observations/102383021> [Access: 29 November 2024]
- iNaturalist (2021g) *Ammophila pictipennis* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/94641365> [Access: 29 November 2024]
- iNaturalist (2021h) *Nysson lateralis* [British Columbia, Jason Headley <jasonheadley>]. <https://www.inaturalist.org/observations/101385829> [Access: 29 November 2024]
- iNaturalist (2021i) *Isodontia mexicana* [Nova Scotia, <ipat>]. <https://www.inaturalist.org/observations/89718617> [Access: 29 November 2024]
- iNaturalist (2021j) *Tachysphex pechumani* [Ontario, Riley Walsh <rileywalsh>]. <https://www.inaturalist.org/observations/83355948> [Access: 29 November 2024]

- iNaturalist (2021k) *Bicyrtes quadrifasciatus* [Quebec, Alain Maire <ama75>]. <https://www.inaturalist.org/observations/89409496> [Access: 29 November 2024]
- iNaturalist (2021l) *Cerceris fumipennis* [Quebec, Alain Maire <ama75>]. <https://www.inaturalist.org/observations/87790962> [Access: 29 November 2024]
- iNaturalist (2021m) *Sceliphron caementarium* [Bermuda, Luke Foster <lukef2006>]. <https://www.inaturalist.org/observations/89381744> [Access: 29 November 2024]
- iNaturalist (2021n) *Ectemnius cephalotes* [Alaska, Matt Muir <muir>]. <https://www.inaturalist.org/observations/89292133> [Access: 29 November 2024]
- iNaturalist (2022a) *Astata unicolor* [New Brunswick, Lena Dietz Chiasson <lenachiasson>]. <https://www.inaturalist.org/observations/137703453> [Access: 29 November 2024]
- iNaturalist (2022b) *Bembix americana* ssp. *comata* [Alaska, Hailey Adler <hailauren>]. <https://www.inaturalist.org/observations/127454003> [Access: 29 November 2024]
- iNaturalist (2022c) *Saygorytes phaleratus* [Prince Edward Island, Barry Cottam <pei-ott>]. <https://www.inaturalist.org/observations/129979387> [Access: 29 November 2024]
- iNaturalist (2022d) *Crossocerus annulipes* [Nova Scotia, <naturefiend>]. <https://www.inaturalist.org/observations/136943983> [Access: 29 November 2024]
- iNaturalist (2022e) *Ectemnius maculosus* [Northwest Territories, <johanna_s>]. <https://www.inaturalist.org/observations/130975388> [Access: 29 November 2024]
- iNaturalist (2022f) *Trypoxylon politum* [Quebec, <piskomantis>]. <https://www.inaturalist.org/observations/131966702> [Access: 29 November 2024]
- iNaturalist (2022g) *Cerceris fumipennis* [New Brunswick, Avery Wells <spavery>]. <https://www.inaturalist.org/observations/133336953> [Access: 29 November 2024]
- iNaturalist (2022h) *Ammophila fernaldi* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/130950122> [Access: 29 November 2024]
- iNaturalist (2022i) *Ammophila pictipennis* [Quebec, Alain Maire <ama75>]. <https://www.inaturalist.org/observations/134634962> [Access: 29 November 2024]
- iNaturalist (2022j) *Sceliphron curvatum* [Nova Scotia, Heather <hcray>]. <https://www.inaturalist.org/observations/134118239> [Access: 29 November 2024]
- iNaturalist (2022k) *Sceliphron caementarium* [Australia, Paul G. Schrijvershof <paulschrijvershof>]. <https://www.inaturalist.org/observations/110944965> [Access: 29 November 2024]
- iNaturalist (2022l) *Sceliphron caementarium* [Azores, Abrão Leite <dracoabe>]. <https://www.inaturalist.org/observations/121505638> [Access: 29 November 2024]
- iNaturalist (2022m) *Philanthus sanbornii* [Quebec, Philippe Hénault <phil_crimson>]. <https://www.inaturalist.org/observations/127165148> [Access: 29 November 2024]
- iNaturalist (2022n) *Prionyx atratus* [Quebec, Mowgly Gagnon <mowgly1>]. <https://www.inaturalist.org/observations/131821305> [Access: 29 November 2024]
- iNaturalist (2022o) *Sphex ichneumoneus* [Quebec, Étienne Govare <etienne111>]. <https://www.inaturalist.org/observations/131080424> [Access: 29 November 2024]
- iNaturalist (2022p) *Philanthus gibbosus* [Quebec, Mathis Boisvert <mathisb21>]. <https://www.inaturalist.org/observations/132845107> [Access: 29 November 2024]
- iNaturalist (2022q) *Crabro latipes* [Saint-Pierre-et-Miquelon, verneau <nonomay>]. <https://www.inaturalist.org/observations/124467257> [Access: 29 November 2024]

- iNaturalist (2023a) *Lestiphorus cockerelli* [Nova Scotia, Sian Bryson <jaegerpilot>]. <https://www.inaturalist.org/observations/181621522> [Access: 29 November 2024]
- iNaturalist (2023b) *Stizoides renicinctus* [Saskatchewan, Ellyne Geurts <ellyne>]. <https://www.inaturalist.org/observations/180855627> [Access: 29 November 2024]
- iNaturalist (2023c) *Nysson lateralis* [Prince Edward Island, Barry Cottam <pei-ott>]. <https://www.inaturalist.org/observations/178607851> [Access: 29 November 2024]
- iNaturalist (2023d) *Crossocerus impressifrons* [New Brunswick, Denis Doucet <nbdragonflyguy>]. <https://www.inaturalist.org/observations/178452185> [Access: 29 November 2024]
- iNaturalist (2023e) *Cerceris arelate* [Nova Scotia, <jacoboffairmont>]. <https://www.inaturalist.org/observations/177351029> [Access: 29 November 2024]
- iNaturalist (2023f) *Cerceris atramontensis* [Nova Scotia, <kathleenfspicer>]. <https://www.inaturalist.org/observations/181965746> [Access: 29 November 2024]
- iNaturalist (2023g) *Eucerceris zonata* [Quebec, Ludo Leclerc <ludoleclerc>]. <https://www.inaturalist.org/observations/174331308> [Access: 29 November 2024]
- iNaturalist (2023h) *Eremnophila aureonotata* [Nova Scotia, Randy Lauff <randylauff>]. <https://www.inaturalist.org/observations/181900952> [Access: 29 November 2024]
- iNaturalist (2023i) *Isodontia mexicana* [Prince Edward Island, Randy Lauff <randylauff>]. <https://www.inaturalist.org/observations/179019040> [Access: 29 November 2024]
- iNaturalist (2023j) *Isodontia mexicana* [Quebec, Christian Grenier <krisskinou>]. <https://www.inaturalist.org/observations/147398436> [Access: 29 November 2024].
- iNaturalist (2023k) *Sceliphron caementarium* [Vanuatu, Dominik Maximilián Ramík <dominik_ramik>]. <https://www.inaturalist.org/observations/149183736> [Access: 29 November 2024]
- iNaturalist (2023l) *Sphecius speciosus* [British Columbia, <cibrink>]. <https://www.inaturalist.org/observations/178249034> [Access: 18 December 2024]
- iNaturalist (2024a) *Bembix pallidipicta* [Quebec, Nick Bédard <nickbedard>]. <https://www.inaturalist.org/observations/197280013> [Access: 29 November 2024]
- iNaturalist (2024b) *Solierella blaisdelli* [Alaska, Alexandria Wenninger <awenninger>]. <https://www.inaturalist.org/observations/200562077> [Access: 29 November 2024]
- iNaturalist (2024c) *Sphex pensylvanicus* [Quebec, Kévin <k087>]. <https://www.inaturalist.org/observations/195611563> [Access: 29 November 2024]
- iNaturalist (2024d) *Sphecius speciosus* [British Columbia, <samree>]. <https://www.inaturalist.org/observations/234927470> [Access: 18 December 2024]
- iNaturalist (2024e) Table of identifiers of apoid wasps in Canada and Alaska. https://www.inaturalist.org/observations?hrank=family&place_id=6712,6&taxon_id=47222&view=identifiers&without_taxon_id=630955 [Access: 29 November 2024]
- iNaturalist (2024f) *Palmodes dimidiatus* [Manitoba, <gbudyk>]. <https://www.inaturalist.org/observations/232783361> [Access: 29 November 2024]
- iNaturalist (2024g) *Cerceris insolita* [Quebec, Ziad Anass <naturecitizen>]. <https://www.inaturalist.org/observations/232809009> [Access: 29 November 2024]
- iNaturalist (2025) Observations of apoid wasps in Canada and Alaska. https://www.inaturalist.org/observations?hrank=family&place_id=6712,6&taxon_id=47222&without_taxon_id=630955 [Access: 6 January 2025]

- Jacobs H-J (2007) Die Grabwespen Deutschlands. Ampulicidae, Sphecidae, Crabronidae. Die Tierwelt Deutschlands, Vol. 79. Goecke & Evers (Kelttern): 1–207. https://books.google.ca/books/about/Die_Grabwespen_Deutschlands.html?id=Rw9NAAAAAYAAJ
- Jobin LJ, Perron J-M (2008) *Cerceris halone* (Banks) (Hymenoptera: Crabronidae) une espèce qui s'ajoute à l'entomofaune du Québec. Le Naturaliste Canadien 132: 24–25. https://provancher-my.sharepoint.com/:b:/g/personal/accesdocuments_provancher_org/EUN8948EcnVMjhWc1UbdMqgBkjH-fUFt18uJ45wXaqCBuQ?e=0ZHEm7
- de Jong Y (2016) Fauna Europaea. Fauna Europaea Consortium. Checklist dataset. <https://doi.org/10.15468/ymk1bx> [Access via GBIF.org: 3 December 2024]
- Kerr JT, Pindar A, Galpern P, Packer L, Potts SG, Roberts SM, Rasmont P, Schweiger O, Colla SR, Richardson LL, Wagner DL (2015) Climate change impacts on bumblebees converge across continents. Science 349(6244): 177–180. <https://doi.org/10.1126/science.aaa7031>
- Kimoto T, Buck M (2014) Rediscovery of *Cerceris fumipennis* (Hymenoptera: Crabronidae) in British Columbia, Canada, with notes on geographic variation and nesting habits. The Canadian Entomologist 147: 419–424. <https://doi.org/10.4039/tce.2014.66>
- Kimsey LS, Carpenter JM (2012) The Vespinae of North America (Vespidae, Hymenoptera). Journal of Hymenoptera Research 28: 37–65. <https://doi.org/10.3897/jhr.28.3514>
- Krombein KV (1938) Notes on the *Passaloecus* of New York State with descriptions of two new species (Hymenoptera: Sphecidae). Bulletin of the Brooklyn Entomological Society 33: 122–127. <https://www.biodiversitylibrary.org/page/50579161>
- Krombein KV (1939) Descriptions and records of new wasps from New York State (Hym.: Sphecidae). Bulletin of the Brooklyn Entomological Society 34: 135–144. <https://www.biodiversitylibrary.org/page/50582064>
- Krombein KV (1950) Synonymical notes on North American sphecoid wasps: III. (Hymenoptera). III. The Nearctic species of *Diodontus* Curtis. Bulletin of the Brooklyn Entomological Society 45: 35–40. <https://www.biodiversitylibrary.org/page/55006342>
- Krombein KV (1951) Superfamily Sphecoidea. In: Muesebeck CFW, Krombein KV, Townes HK (Eds) Hymenoptera of America north of Mexico, Synoptic Catalog. United States Department of Agriculture, Agriculture Monograph No. 2. United States Government Printing Office (Washington): 937–1034. <https://doi.org/10.5962/bhl.title.65057>
- Krombein KV (1955) Synonymical notes on North American sphecoid wasps. IV. Some synonymy in *Oxybelus* and description of a new subspecies (Hymenoptera). Bulletin of the Brooklyn Entomological Society 50: 70–74. <https://www.biodiversitylibrary.org/page/54947456>
- Krombein KV (1958) *Pison* (*Paraceramius*) *koreense* (Rad.), a new adventive wasp in eastern United States (Hymenoptera, Sphecidae). Entomological News 69: 166–167. <http://biodiversitylibrary.org/page/2739059>
- Krombein KV (1959) Two additional adventive European wasps in the United States (Hymenoptera: Sphecidae, Chrysididae). Bulletin of the Brooklyn Entomological Society 54: 95–96. <https://www.biodiversitylibrary.org/page/50590357>
- Krombein KV (1961) *Passaloecus turionum* Dahlbom, an adventive European wasp in the United States (Hymenoptera, Sphecidae). Entomological News 72: 258–259. <http://biodiversitylibrary.org/page/2666668>

- Krombein KV (1963) Notes on the *Entomognathus* of eastern United States (Hymenoptera: Sphecidae). Proceedings of the Biological Society of Washington 76: 247–258. <https://www.biodiversitylibrary.org/page/34605142>
- Krombein KV (1967) Trap-nesting wasps and bees: life histories, nests, and associates. Smithsonian Press (Washington, D.C.): i–vi, 1–570. <https://doi.org/10.5962/bhl.title.46295>
- Krombein KV (1973) Notes on North American *Stigmus* Panzer (Hymenoptera, Sphecoidea). Proceedings of the Biological Society of Washington 86: 211–229. <https://www.biodiversitylibrary.org/page/34560365>
- Krombein KV (1979) Superfamily Sphecoidea. In: Krombein KV, Hurd Jr PD, Smith DR, Burks BD (Eds) Catalog of Hymenoptera in America north of Mexico, Vol. 2. Smithsonian Institution Press (Washington): 1573–1740. <https://www.biodiversitylibrary.org/page/4575614>
- Krombein KV, Shanks Gingras S (1984) Revision of North American *Liris* Fabricius (Hymenoptera: Sphecoidea: Larridae). Smithsonian Contributions to Zoology 404: 1–96. <https://doi.org/10.5479/si.00810282.404>
- Kurczewski FE (1998) Dispersal and range expansion of an introduced sand wasp, *Oxybelus bipunctatus* (Hymenoptera: Sphecidae), in northeastern North America. Entomological News 109: 1–6. <https://www.biodiversitylibrary.org/page/2727368>
- Kurczewski FE (2000) History of white pine (*Pinus strobus*)/oak savanna in southern Ontario, with particular reference to the biogeography and status of the antenna-waiving wasp, *Tachysphex pechumani* (Hymenoptera: Sphecidae). The Canadian Field-Naturalist 114: 1–20. <https://doi.org/10.5962/p.363908>
- Kurczewski FE (2010) Analysis of ecology, nesting behavior, and prey in North American, Central American, and Caribbean *Tachysphex* (Hymenoptera: Crabronidae). Northeastern Naturalist 17, Monograph 6: 1–78. <https://doi.org/10.1656/045.017.m601>
- Kurczewski FE, Abela AJ, Ubick D (2020) Additional observations on the nesting behavior of *Miscophus* (*Nitelopterus*) *californicus* (Ashmead) (Hymenoptera: Crabronidae). Insecta Mundi 0773: 1–4. <https://journals.flvc.org/mundi/article/view/123456>
- Kurczewski FE, Boyle HF (2006) [2005] Nesting behavior, ecology, seasonal and geographic distribution of the sand wasp, *Stictiella emarginata* (Hymenoptera: Sphecidae). The Canadian Field-Naturalist 119: 6–15. <https://doi.org/10.22621/cfn.v119i1.75>
- Leclerc L, Dodgson D, Buck M (in press) Rediscovery of *Eucerceris zonata* (Say) (Hymenoptera: Crabronidae), a species thought to be extirpated in Canada. The Great Lakes Naturalist.
- Leclercq J (1996) Hyménoptères Sphécides Crabroniens du genre *Anacrabro* Packard, 1866 des deux Amériques. Lambillionea 96: 471–478. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_1996c_Anacrabro.pdf
- Leclercq J (2000) Hyménoptères Sphécides Crabroniens des Amériques du genre *Crossocerus* Lepeletier & Brullé, 1835. Notes Fauniques de Gembloux 40: 3–75. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2000d_American_Crossocerus.pdf
- Leclercq J (2002) Hyménoptères Crabronides Crabroniens des Amériques du genre *Rhopalum* Stephens, 1829. Notes Fauniques de Gembloux 48: 3–115. <http://researcharchive.>

- [calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2002b_American_Rhopalum.pdf](http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2002b_American_Rhopalum.pdf)
- Leclercq J (2006) Hyménoptères Crabroniens des Amériques du genre *Lestica* Billberg, 1820 (Hymenoptera: Crabronidae: Crabronini). Notes Fauniques de Gembloux 59: 215–218. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2006d_American_Lestica.pdf
- Leclercq J (2007a) Hyménoptères Crabroniens des Amériques du genre *Anacrabro* Packard, 1866 (Hymenoptera: Crabronidae Crabroninae). Notes Fauniques de Gembloux 60: 141–143. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2007d_American_Anacrabro.pdf
- Leclercq J (2007b) Hyménoptères Crabroniens des Amériques du genre *Ectemnius* Dahlbom 1845 (Hymenoptera: Crabronidae Crabronini). Notes Fauniques de Gembloux 60: 163–177. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2007e.pdf
- Leclercq J (2008) Hyménoptères Crabroniens d'Amérique du genre *Crabro* Fabricius 1775 (Hymenoptera: Crabronidae Crabroninae). Faunistic Entomology – Entomologie Faunistique 61: 75–84. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2008b_American_Crabro.pdf
- Leclercq J (2012) Hyménoptères Crabroniens d'Amérique du Nord et d'Amérique centrale du genre *Entomognathus* Dahlbom 1844 (Hymenoptera: Crabronidae Crabronini). Entomologie Faunistique – Faunistic Entomology 65: 119–126. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Leclercq_2012b_Entomognathus.pdf
- Lewis J (2020) *Sphex ichneumoneus* and *Sphex pensylvanicus* (Hymenoptera: Sphecidae) in Atlantic Canada: evidence of recent range expansion into the region. Canadian Field-Naturalist 134: 52–55. <https://doi.org/10.22621/cfn.v134i1.2413>
- Liebert AE, Gamboa GJ, Stamp NE, Curtis TR, Monnet KM, Turillazzi S, Starks PT (2006) Genetics, behavior and ecology of a paper wasp invasion: *Polistes dominulus* in North America. Annales Zoologici Fennici 43: 595–624. <https://www.sekj.org/PDF/anz43-free/anz43-595.pdf>
- Lomholdt O (1975) The Sphecidae (Hymenoptera) of Fennoscandia and Denmark. Fauna Entomologica Scandinavica 4, part 1. Scandinavian Science Press (Klampenborg, Denmark): 1–224. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Lomholdt_1975_1976_Fenoscandia_1a.pdf
- Lomholdt O (1982) On the origin of the bees (Hymenoptera: Apidae, Sphecidae). Insect Systematics & Evolution 13: 185–190. <https://doi.org/10.1163/187631282X00093>
- Malloch JR (1933) Review of the wasps of the subfamily Pseninae of North America (Hymenoptera: Aculeata). Proceedings of the United States National Museum 82: 1–60. <https://doi.org/10.5479/si.00963801.82-2967.1>
- Malloch JR, Rohwer SA (1930) New forms of sphecoid wasps of the genus *Didineis* Wesmael. Proceedings of the United States National Museum 77(14): 1–7. <https://doi.org/10.5479/si.00963801.77-2837.1>
- Marshall SA (2023) Hymenoptera: the natural history & diversity of wasps, bees & ants. Firefly Books (Buffalo, New York), 1–638. <https://www.fireflybooks.com> [Access: 7 February 2025]

- Meier R, Shiyang K, Vaidya G, Ng PK (2006) DNA barcoding and taxonomy in Diptera: a tale of high intraspecific variability and low identification success. *Systematic Biology* 55(5): 715–28. <https://doi.org/10.1080/10635150600969864>
- Menke AS (1964) A new subgenus of *Ammophila* from the Neotropical Region (Hymenoptera: Sphecidae). *The Canadian Entomologist* 96: 874–883. <https://doi.org/10.4039/Ent96874-6>
- Menke AS (1988) *Pison* in the New World: a revision (Hymenoptera: Sphecidae: Trypoxylini). *Contributions of the American Entomological Institute* 24(3): iii + 171 pp. <https://www.biodiversitylibrary.org/page/63317496>
- Menke AS (1992) Mole cricket hunters of the genus *Larra* in the New World (Hymenoptera: Sphecidae, Larrinae). *Journal of Hymenoptera Research* 1: 175–234. <http://biodiversitylibrary.org/page/4490049>
- Menke AS (2020) The *Ammophila* of North & Central America (Hymenoptera, Sphecidae). *Ammophila Press* (Bisbee), 1–162. [Fourth printing (2021)] http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Menke_2021_Fourth_Printing.pdf
- Mesaglio T, Soh A, Kurniawidjaja S, Sexton C (2021) ‘First Known Photographs of Living Specimens’: the power of iNaturalist for recording rare tropical butterflies. *Journal of Insect Conservation* 25: 905–911. <https://doi.org/10.1007/s10841-021-00350-7>
- Mesaglio T, Callaghan CT, Samonte F, Gorta SBZ, Cornwell WK (2023) Recognition and completeness: two key metrics for judging the utility of citizen science data. *Frontiers in Ecology and the Environment* 21(4): 167–174. <https://doi.org/10.1002/fee.2604>
- Miller GL, Donnelly CR, Gamboa GJ (2013) A ten-year comparative study of the population dynamics and parasitoidism in the native paper wasp *Polistes fuscatus* and the invasive *P. dominulus*. *Insectes sociaux* 60: 49–56. <https://doi.org/10.1007/s00040-012-0264-4>
- Miller RC (1976) A review of the *hilaris* species group of *Crabro* (Hymenoptera: Sphecidae). *The Florida Entomologist* 59: 241–265. <https://doi.org/10.2307/3494259>
- Müller H (1872) Anwendung der Darwinschen Lehre auf Bienen. *Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westphalens* 29: 1–96. https://www.zobodat.at/pdf/Verh-nathist-Ver-preuss-Rheinlande_29_0001-0096.pdf
- Murray WD (1940) *Podalonia* (Hymenoptera: Sphecidae) of North and Central America. *Entomologica Americana* 20: 1–77. <https://www.biodiversitylibrary.org/page/50647479>
- Nemkov PG (2010) A review of the subtribe Gorytina (Hymenoptera, Crabronidae, Bembicini) with a key to the genera. *Euroasian Entomological Journal* 9: 501–505. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Nemkov_2010b_Gorytina.pdf
- Nemkov PG, Ohl M (2011) A cladistic analysis and reclassification of the tribe Bembicini (Hymenoptera: Crabronidae: Bembicinae). *Zootaxa* 2801: 27–47. <https://doi.org/10.11646/zootaxa.2801.1.2>
- Ohl M (1999) A revision of *Stizoides* Guérin-Méneville, 1844: taxonomy, phylogenetic relationships, biogeography, and evolution (Hymenoptera: Apoidea, “Sphecidae”). *Mitteilungen aus dem Museum für Naturkunde in Berlin, Zoologische Reihe* 75: 63–169. <https://doi.org/10.1002/mmzn.19990750108>

- Onuferko TM, Buck M, Gibbs J, Sokoloff PC (2023) Asymmetric responses by bees and aculeate wasps to dune stabilisation across the southern Canadian prairies. *Insect Conservation and Diversity* 16: 626–637. <https://doi.org/10.1111/icad.12659>
- Palmier KM, Sheffield CS (2019) First records of the common eastern bumble bee, *Bombus impatiens* Cresson (Hymenoptera: Apidae, Apinae, Bombini) from the Prairies Ecozone in Canada. *Biodiversity Data Journal* 2019(7): e30953. [18 pp.] <https://doi.org/10.3897/BDJ.7.e30953>
- Parker FD (1962) On the subfamily Astatinae, with a systematic study of the genus *Astata* of America north of Mexico (Hymenoptera: Sphecidae). *Annals of the Entomological Society of America* 55: 643–659. <https://doi.org/10.1093/aesa/55.6.643>
- Parker FD (1969) On the subfamily Astatinae. Part VI. The American species in the genus *Dryudella* Spinola (Hymenoptera: Sphecidae). *Annals of the Entomological Society of America* 62: 963–976. <https://doi.org/10.1093/aesa/62.5.963>
- Parker FD (1972) On the subfamily Astatinae. Part VII. The genus *Diploplectron* Fox (Hymenoptera: Sphecidae). *Annals of the Entomological Society of America* 65: 1192–1203. <https://doi.org/10.1093/aesa/65.5.1192>
- Parker JB (1929) A generic revision of the fossorial wasps of the tribes Stizini and Bembicini, with notes and descriptions of new species. *Proceedings of the United States National Museum* 75(5): 1–203. <https://doi.org/10.5479/si.00963801.75-2776.1>
- Pate VSL (1937) The third Nearctic species of *Nitela*, with remarks on the genera *Tenila* Brèthes and *Rhinotenila* Williams (Hymenoptera: Sphecidae). *Bulletin of the Brooklyn Entomological Society* 32: 5–7. <https://www.biodiversitylibrary.org/page/50578802>
- Pate VSL (1938) Studies in the Nyssonine wasps. IV. New or redefined genera of the tribe Nyssonini, with descriptions of new species (Hymenoptera: Sphecidae). *Transactions of the American Entomological Society* 64: 117–190. <https://www.jstor.org/stable/25077413>
- Pate VSL (1940) The taxonomy of the Oxybeline wasps (Hymenoptera: Sphecidae) II. The classification of the genera *Belomicrus* and *Enchemicrum*. *Transactions of the American Entomological Society* 66: 209–264. <https://www.jstor.org/stable/25077459>
- Pate VSL (1944) [1943] The subgenera of *Crossocerus* with a review of the Nearctic species of the subgenus *Blepharipus* (Hymenoptera: Sphecidae: Pemphilidini). *Lloydia* 6: 267–317. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Pate_1944a.pdf
- Pate VSL (1946) [1945] North American species of the genus *Lestiphorus* (Hymenoptera: Sphecidae: Gorytini). *The Canadian Entomologist* 77: 210–213. <https://doi.org/10.4039/Ent77210-11>
- Pate VSL (1947) New Pemphilidine wasps, with notes on previously described forms: II. (Hymenoptera: Sphecidae). *Notulae Naturae* 185: 1–14. https://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Pate_1947a.pdf
- Peters RS, Krogmann L, Mayer C, Donath A, Gunkel S, Meusemann K, Kozlov A, Podsiadlowski L, Petersen M, Lanfear R, Diez PA, Heraty J, Kjer KM, Klopstein S, Meier R, Polidori C, Schmitt T, Liu S, Zhou X, Wappler T, Rust J, Misof B, Niehuis O (2017) Evolutionary history of the Hymenoptera. *Current Biology* 27: 1013–1018. <https://doi.org/10.1016/j.cub.2017.01.027>

- Provancher L (1877–1882) Faune canadienne. Les Insectes – Hyménoptères. Le Naturaliste Canadien 9 (1877): 346–349, 353–370; 10 (1878): 11–18, 47–58, 65–73, 97–108, 161–170, 193–209, 225–238, 257–273, 289–299, 349–352, 353–365; 11 (1879): 2–13, 33–43, 65–76, 119–125, 129–143 (No. 125), 109–122 (No. 126), 141–150 (No. 127), 173–185, 205–233, 248–266, 269–281; 12 (1880): 4–22, 33–48, 65–81, 97–102, 130–147, 161–180; 12 (1881): 193–207, 225–241, 257–269, 289–304, 321–333, 352–362; 13 (1882): 4–15, 33–51, 65–81, 97–110, 129–144, 161–175, 193–209, 225–242, 257–269. <https://biodiversitylibrary.org/page/7606064>
- Provancher L (1883a) Faune canadienne. Hyménoptères. Additions et Corrections. Le Naturaliste Canadien 14: 3–20, 33–38. <https://biodiversitylibrary.org/page/14857444>
- Provancher L (1883b) Petite faune entomologique du Canada et particulièrement de la province du Québec. Vol. II comprenant les Orthoptères, les Névroptères et les Hyménoptères. Typographie de C. Darveau (Québec): I–VII, 1–831. <https://doi.org/10.5962/bhl.title.38552>
- Provancher L (1885–1889) Additions et corrections au volume II de la faune entomologique du Canada traitant des Hyménoptères. Typographie de C. Darveau (Québec), 1–475. <https://doi.org/10.5962/bhl.title.46411>
- Pulawski WJ (1984) The status of *Trypoxylon figulus* (Linnaeus, 1758), *medium* de Beaumont, 1945, and *minus* de Beaumont, 1945 (Hymenoptera: Sphecidae). Proceedings of the California Academy of Sciences 43: 123–140. <https://www.biodiversitylibrary.org/page/15775437>
- Pulawski WJ (1988) Revision of North American *Tachysphex* wasps including Central American and Caribbean species (Hymenoptera: Sphecidae). Memoirs of the California Academy of Sciences 10: 1–211. <https://www.biodiversitylibrary.org/page/15651899>
- Pulawski WJ (2025) Catalog of Sphecidae sensu lato (= Apoidea excluding Apidae). California Academy of Sciences. <https://www.calacademy.org/scientists/projects/catalog-of-sphecidae> [Access: 19 December 2024]
- Ratnasingham S, Hebert PDN (2007) BOLD: The barcode of life data system (www.barcodinglife.org). Molecular Ecology Notes 7: 355–364. <https://doi.org/10.1111/j.1471-8286.2007.01678.x>
- Ratnasingham S, Hebert PDN (2013) A DNA-based registry for all animal species: the barcode index number (BIN) system. PLoS ONE 8: e66213. <https://doi.org/10.1371/journal.pone.0066213>
- Ratzlaff CG (2016) [2015] Checklist of the spheciform wasps (Hymenoptera: Crabronidae & Sphecidae) of British Columbia. Journal of the Entomological Society of British Columbia 112: 19–46. <https://journal.entsocbc.ca/index.php/journal/article/view/894>
- Ratzlaff CG (2018) New records of Hymenoptera from British Columbia and Yukon. Journal of the Entomological Society of British Columbia 115: 110–122. <https://journal.entsocbc.ca/index.php/journal/article/view/1005>
- Ratzlaff CG, Needham KM, Scudder GGE (2016) Notes on insects recently introduced to Metro Vancouver and other newly recorded species from British Columbia. Journal of the Entomological Society of British Columbia 113: 79–89. <https://journal.entsocbc.ca/index.php/journal/article/view/931>
- Rehan SM, Sheffield CS (2011) Morphological and molecular delineation of a new species in the *Ceratina dupla* species-group (Hymenoptera: Apidae: Xylocopinae) of eastern North America. Zootaxa 2873: 35–50. <https://doi.org/10.11646/zootaxa.2873.1.3>

- Rohwer SA (1921) Some notes on wasps of the subfamily Nyssoninae, with descriptions of new species. *Proceedings of the United States National Museum* 59: 403–413. <https://doi.org/10.5479/si.00963801.2374.403>
- Sandhouse GA (1940) A review of the Nearctic wasps of the genus *Trypoxylon* (Hymenoptera: Sphecidae). *The American Midland Naturalist* 24: 133–176. <https://doi.org/10.2307/2421057>
- Sann M, Meusemann K, Niehuis O, Escalona HE, Mokrousov M, Ohl M, Paul T, Schmid-Egger C (2021) Reanalysis of the apoid wasp phylogeny with additional taxa and sequence data confirms the placement of Ammoplanidae as sister to bees. *Systematic Entomology* 46: 558–569. <https://doi.org/10.1111/syen.12475>
- Sann M, Niehuis O, Peters RS, Mayer C, Kozlov A, Podsiadlowski L, Bank S, Meusemann K, Misof B, Bleidorn C, Ohl M (2018) Phylogenomic analysis of Apoidea sheds new light on the sister group of bees. *BMC Evolutionary Biology* 18(71): 1–15. <https://doi.org/10.1186/s12862-018-1155-8>
- Schmid-Egger C, Straka J, Ljubomirov T, Blagoev GA, Morinière J, Schmidt S (2018) DNA barcodes identify 99 per cent of apoid wasp species (Hymenoptera: Ampulicidae, Crabronidae, Sphecidae) from the Western Palearctic. *Molecular Ecology Resources* 19(2): 476–484. <https://doi.org/10.1111/1755-0998.12963>
- Scudder GGE (1994) An annotated systematic list of potentially rare and endangered freshwater and terrestrial invertebrates in British Columbia. *Occasional Papers of the Entomological Society of British Columbia* 2: 1–92. <https://doi.org/10.5962/bhl.title.110150>
- Scullen HA (1965) Review of the genus *Cerceris* in America north of Mexico (Hymenoptera: Sphecidae). *Proceedings of the United States National Museum* 116: 333–547. <https://doi.org/10.5479/si.00963801.116-3506.333>
- Scullen HA (1968) A revision of the genus *Eucerceris* Cresson (Hymenoptera: Sphecidae). *United States National Museum Bulletin* 268: 1–97. <https://doi.org/10.5479/si.03629236.268.1>
- Shafer GD (1949) *The ways of a mud dauber*. Stanford University Press (Stanford): i–xiii, 1–78.
- Sheffield CS (2017) *Diploplectron ferrugineum* Ashmead, 1899 from Canada, with comments on the type locality (Hymenoptera: Crabronidae: Astatinae). *Pan-Pacific Entomologist* 93: 159–162. <https://doi.org/10.3956/2017-93.2.159>
- Sheldon JK (1968) The nesting behavior and larval morphology of *Pison koreense* (Radoszkowski) (Hymenoptera: Sphecidae). *Psyche* 75: 107–117. <https://doi.org/10.1155/1968/92670>
- Sikes DS, Allen RT (2016) First Alaskan records and a significant northern range extension for two species of Diplura (Diplura, Campodeidae). *ZooKeys* 563: 147–157. <https://doi.org/10.3897/zookeys.563.6404>
- Siri ML, Bohart RM (1974) A review of the genus *Mellinus* (Hymenoptera: Sphecidae). *The Pan-Pacific Entomologist* 50: 169–176. <https://www.biodiversitylibrary.org/page/53913357>
- Slansky Wasbauer J (1978) Revision of New World species of the genus *Miscophus* Jurine (Hymenoptera: Sphecidae). PhD thesis. University of California (Davis), 1–159.
- Smith HS (1908) The Sphegoidea of Nebraska. *University Studies. The University of Nebraska* 8: 323–410. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Smith_H_1908b.pdf

- Smith NJ (1983) New North American *Pulverro* Pate with a key to the species (Hymenoptera: Sphecidae). The Pan-Pacific Entomologist 59: 256–266. <https://www.biodiversitylibrary.org/page/56199394>
- Smith NJ (2009) [2008] A review of Nearctic *Ammoplanus* Giraud 1869 (Hymenoptera: Crabronidae). The Pan-Pacific Entomologist 84: 301–333. <https://doi.org/10.3956/2007-56.1>
- Smith NJ (2010) [2009] A review of the Nearctic species of *Parammoplanus* (Pate) with descriptions of new species (Hymenoptera: Crabronidae). The Pan-Pacific Entomologist 85: 107–149. <https://doi.org/10.3956/2009-02.1>
- Smith NJ (2019) A review of the North American species of *Ammoplanellus* Gussakovskij, 1931 (Hymenoptera: Ammoplanidae: Ammoplanina), with descriptions of a new subgenus, *Ammoplanellus* (*Pseudammoplanellus*), and seven new species. Pan-Pacific Entomologist 95: 65–81. <https://doi.org/10.3956/2019-95.2.65>
- Smith NJ (2020) Addition of a new genus and two new species to the family Ammoplanidae (Hymenoptera). Pan-Pacific Entomologist 96: 239–245. <https://doi.org/10.3956/2020-96.3.239>
- Soroye P, Newbold T, Kerr J (2020) Climate change contributes to widespread declines among bumble bees across continents. Science 367(6478): 685–688. <https://doi.org/10.1126/science.aax8591>
- Spencer GJ, Wellington WG (1948) A preliminary list of the Sphecinae of British Columbia (Hymenoptera). Proceedings of the Entomological Society of British Columbia 44: 10. <https://www.biodiversitylibrary.org/page/49119836>
- Steiner AL (1973) Solitary wasps from subarctic North America – II. Sphecidae from the Yukon and Northwest Territories, Canada: Distribution and ecology. Quaestiones Entomologicae 9: 13–34. <https://www.biodiversitylibrary.org/page/52005315>
- Strickland EH (1947) An annotated list of the wasps in Alberta. The Canadian Entomologist 79: 121–130. <https://doi.org/10.4039/Ent79121-7>
- UAM (2024) University of Alaska Insect Collection. <https://dx.doi.org/doi:10.7299/X75D-8S0H> [Access: 3 December 2024]
- van der Vecht J (1984) Die orientalische Mauerwespe *Sceliphron curvatum* (Smith, 1870) in der Steiermark, Österreich (Hymenoptera, Sphecidae). Entomofauna 5: 213–219. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/van_der_Vecht_1984a_Sceliphron_curvatum.pdf
- van Lith JP (1975) Neotropical species of *Psen* and *Pseneo* (Hymenoptera, Sphecidae, Psenini). Tijdschrift voor Entomologie 118: 1–41. <https://www.biodiversitylibrary.org/page/28195289>
- Veit MF, Ascher JS, Milam J, Morrison FR, Goldstein PZ (2022) A checklist of the bees of Massachusetts (Hymenoptera: Apoidea: Anthophila). Journal of the Kansas Entomological Society 94: 81–157. <https://doi.org/10.2317/0022-8567-94.2.81>
- Vincent DL (1979) [1978] A revision of the genus *Passaloecus* (Hymenoptera: Sphecidae) in America north of Mexico. The Wasmann Journal of Biology 36: 127–198. <https://digitalcollections.usfca.edu/digital/collection/p15129coll11/id/737/rec/81>
- Weissmann MJ, Kondratieff BC (1999) An inventory of arthropod fauna at Great Sand Dunes National Monument, Colorado. In Byers GW, Hagen RH, Brooks RW (Eds)

- Entomological Contribution in Memory of Byron A. Alexander. The University of Kansas Natural History Museum Special Publication No. 24, 69–80. http://researcharchive.calacademy.org/research/entomology/Entomology_Resources/Hymenoptera/sphecidae/copies/Weissmann_Kondratieff_1999.pdf
- White E, Soltis PS, Soltis DE, Guralnick R (2023) Quantifying error in occurrence data: Comparing the data quality of iNaturalist and digitized herbarium specimen data in flowering plant families of the southeastern United States. PLoS ONE 18(12): e0295298. [17 pp.] <https://doi.org/10.1371/journal.pone.0295298>
- Wikipedia (2024) List of national parks of Canada. https://en.wikipedia.org/wiki/List_of_national_parks_of_Canada [Access: 3 December 2024]
- Williams FX (1950) The wasps of the genus *Solierella* in California (Hymenoptera, Sphecidae, Larrinae). Proceedings of the California Academy of Sciences (4. Series) 26: 355–417. <https://www.biodiversitylibrary.org/page/15656169>
- Williams FX (1954) The wasps of the genus *Pisonopsis* Fox (Hymenoptera: Sphecidae). The Pan-Pacific Entomologist 30: 235–246. <https://www.biodiversitylibrary.org/page/56384400>
- Williams FX (1960) The wasps of the genus *Plenoculus* (Hymenoptera: Sphecidae, Larrinae). Proceedings of the California Academy of Sciences (4. Series) 31: 1–49. <http://biodiversitylibrary.org/page/15657725>
- Wrigley RE (2019) A remarkable emergence of the long-horned beetle *Meriellum proteus* (Kirby 1837) (Coleoptera, Cerambycidae) and presence of diverse Hymenoptera on white spruce logs. Bulletin of the Entomological Society of Canada 51: 36–51. <https://esc-sec.ca/wp-content/uploads/2019/12/Bulletin-Volume51-number1-Mar2019.pdf>

Appendix I

Alphabetic list of type material examined

We studied type material of 31 nominal species plus images of types of 26 species (noted by asterisk *). Primary types (holotypes, lectotypes or neotypes) were examined unless otherwise noted. All listed species names are currently treated as valid except if noted otherwise. Original combinations (orig. comb.) are mentioned for species that were described in other genera. Species noted as extralimital do not occur in the area of the checklist but were examined in order to clarify their identity and to rule out confusion with Canadian species. Taxonomic changes that resulted from the examination are noted for each species, as well as confirmed synonymies. Acronyms of depositories: Academy of Natural Sciences, Philadelphia, Pennsylvania (**ANSP**); United States National Museum, Washington, DC (**USNM**); University of Nebraska, Lincoln, Nebraska (**UNSM**); Bohart Museum of Entomology, University of California, Davis, California (**BMEC**); Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (**MCZC**); Snow Entomological Museum, University of Kansas, Lawrence, Kansas (**SEMC**); Collection Entomologique de l'Université Laval, Laval, Quebec (**ULQC**); Museum

of Zoology, University of Michigan, Ann Arbor, Michigan (**UMMZ**); Canadian National Collection of Insects, Ottawa, Ontario (**CNC**). Abbreviation: TL – Type locality (only state or province mentioned, not the exact locality).

- **Cerceris alaope* Banks, 1912, MCZC: extralimital (TL: Virginia). We are unable to distinguish this species from *C. prominens* (see below), a Canadian species, based on the provided images or descriptions in the literature. Both species were described in the same paper.
- **Cerceris banksi* Scullen, 1965 [synonym of *C. alaope*, see previous], MCZC: extralimital (TL: Virginia).
- **Cerceris dakotensis* Banks, 1915 [synonym of *C. vicina* Cresson, 1865], MCZC: extralimital (TL: North Dakota).
- **Cerceris nebrascensis* H. Smith, 1908, UNSM: extralimital (TL: Nebraska).
- **Cerceris prominens* Banks, 1912, MCZC: new for Canada, see note above, under *C. alaope* (TL: Virginia).
- Crabro leopardus* R. Bohart, 1976, paratypes, BMEC: new for Canada (TL: California).
- Crossocerus eriogoni* (Rohwer, 1908) [orig. comb.: *Crabro*], USNM: **synonymized** with *C. minimus* (Packard) (TL: Colorado).
- **Diodontus adamsi* Titus, 1909, UMMZ: occurs in Canada, Alaska (TL: Michigan).
- **Diodontus americanus* Packard, 1867, MCZC: occurs in Canada, Alaska (TL: Maine).
- **Diodontus antennatus* (Mickel, 1906) [orig. comb.: *Xylocelia*], UNSM: **reinstated** from synonymy with *D. metathoracicus* (Mickel), extralimital (TL: Nebraska).
- **Diodontus argentinae* Rohwer, 1909, USNM: occurs in Canada (TL: Colorado).
- Diodontus ater* (Mickel, 1916) [orig. comb.: *Xylocelia*], UNSM: **revised synonymy** with *D. nigrinus* Fox (removed from synonymy with *D. flavitarsis* Fox) (TL: Nebraska).
- Diodontus beulahensis* (Rohwer, 1917) [orig. comb.: *Xylocelia*], USNM: tentative revised synonymy with *D. americanus* Packard (removed from synonymy with *D. flavitarsis* Fox) (TL: New Mexico).
- Diodontus brunneicornis* Viereck, 1906, SEMC: extralimital (TL: Kansas).
- Diodontus cockerelli* Rohwer, 1909, USNM: extralimital (TL: Colorado).
- Diodontus flavitarsis* Fox, 1892, ANSP: new for Canada (TL: Colorado).
- Diodontus florissantensis* Rohwer, 1909, USNM: **revised synonymy** with *D. americanus* Packard (removed from synonymy with *D. rugosus* Fox) (TL: Colorado).
- Diodontus fraternus* Rohwer, 1909, USNM: new for Canada (TL: Colorado).
- Diodontus gillettei* Fox, 1892, ANSP: **synonymized** with *D. americanus* Packard (TL: Colorado).
- Diodontus leguminiferus* Cockerell, 1897, ANSP: occurs in Canada (TL: New Mexico).
- Diodontus maestus* (Mickel, 1916) [orig. comb.: *Xylocelia*], UNSM: **revised synonymy** with *D. nigrinus* Fox (removed from synonymy with *D. flavitarsis* Fox) (TL: Nebraska).
- **Diodontus metathoracicus* (Mickel, 1916) [orig. comb.: *Xylocelia*], UNSM: new for Canada (TL: Nebraska).
- Diodontus neomexicanus* Rohwer, 1909, USNM: occurs in Canada (TL: New Mexico).
- Diodontus nigrinus* Fox, 1892, ANSP: **reinstated** from synonymy with *D. flavitarsis* Fox, occurs in Canada, Alaska (TL: Colorado).

Diodontus occidentalis Fox, 1892, ANSP: extralimital (TL: California).

Diodontus rugosus Fox, 1892, ANSP: **synonymized** with *D. americanus* Packard (TL: Montana).

Diodontus siouxensis* (Mickel, 1916) [orig. comb.: *Xylocelia*], UNSM: **synonymized with *D. americanus* Packard (TL: Nebraska).

**Diodontus spiniferus* (Mickel, 1916) [orig. comb.: *Xylocelia*], UNSM: occurs in Canada, Alaska (TL: Nebraska).

Diodontus striatus* (Mickel, 1916) [orig. comb.: *Xylocelia*], UNSM: **synonymized with *D. americanus* Packard (TL: North Dakota).

Diodontus vallicolae Rohwer, 1909, USNM: **synonymized** with *D. nigrinus* Fox (TL: Colorado).

Diodontus vallicolae salicis Rohwer, 1909, USNM: **revised synonymy** with *D. nigrinus* Fox (removed from synonymy with *D. vallicolae*) (TL: Colorado).

**Diodontus virginianus* (Rohwer, 1917) [orig. comb.: *Xylocelia*], USNM: occurs in Canada (TL: Virginia).

**Gorytes angustus* (Provancher, 1895) [orig. comb.: *Hoplissus*], ULQC: occurs in Canada (TL: California).

Gorytes atrifrons Fox, 1892, ANSP: extralimital (TL: Nevada).

Gorytes decorus Fox, 1896, ANSP: **reinstated** from synonymy with *G. atricornis* Packard, new for Canada (TL: Montana).

Gorytes nevadensis Fox, 1892, ANSP: extralimital (TL: Nevada).

**Mimesa cheyenne* Finnamore, 1983, CNC: new for Canada (TL: Colorado).

Mimumesa mixta (Fox, 1898) [orig. comb.: *Psen*], ANSP: occurs in Canada, Alaska (TL: Washington).

Mimumesa nigra (Packard, 1867) [orig. comb.: *Psen*], ANSP: occurs in Canada (TL: Virginia).

Mimumesa propinqua (Kincaid, 1900) [orig. comb.: *Mimesa*], USNM: occurs in Canada, Alaska (TL: Alaska).

**Oxybelus dilutus* Baker, 1896, USNM: synonymy with *O. emarginatus* Say confirmed (TL: Colorado).

Oxybelus pacificus* (Rohwer, 1909) [orig. comb.: *Notoglossa*], USNM: **reinstated from synonymy with *O. emarginatus* Say, new for Canada (TL: Washington).

**Oxybelus robertsonii* Baker, 1896, USNM: occurs in Canada (TL: Colorado).

**Oxybelus trifidus* Cockerell & Baker, 1896, USNM: synonymy with *O. argenteopilosus* Cameron suspected (currently considered a synonym of *O. emarginatus*), extralimital (TL: New Mexico).

Passaloecus melanognathus Rohwer, 1910, USNM: extralimital (TL: Oregon).

**Prionyx canadensis* (Provancher, 1887), ULQC: see Taxonomy notes below, occurs in Canada (TL: Ontario, likely in error).

**Solierella affinis* (Rohwer, 1909) [orig. comb.: *Niteliopsis*], USNM: occurs in Canada (TL: Colorado).

Solierella fossor (Rohwer, 1909) [orig. comb.: *Niteliopsis*], USNM: extralimital (TL: Colorado).

Solierella foxii (Viereck, 1906) [preoccupied, orig. comb.: *Niteliopsis*], SEMC: **reinstated** from synonymy with *S. fossor* (Rohwer), new for Canada as *S. mammillata* Buck **nom. nov.** (TL: Kansas).

**Solierella lucida* (Rohwer, 1909) [orig. comb.: *Niteliopsis*], USNM: status unclear, see Taxonomy notes below, extralimital(?) (TL: Colorado).

Solierella modesta (Rohwer, 1909) [orig. comb.: *Niteliopsis*], USNM: extralimital (TL: Colorado).

**Solierella nigra* (Rohwer, 1909) [preoccupied, orig. comb.: *Niteliopsis*], USNM: new for Canada as *S. nigrans* Krombein (replacement name) (TL: Colorado).

**Solierella sayi* (Rohwer, 1909) [orig. comb.: *Niteliopsis*], USNM: occurs in Canada (TL: Colorado).

**Solierella vierecki* (Rohwer, 1909) [orig. comb.: *Niteliopsis*], USNM: new for Canada (TL: Colorado).

Spilomena clypearis N. Smith, 1995, paratypes, BMEC: new for Canada (TL: California).

Spilomena montana R. Bohart, 1995, paratypes, BMEC: both male paratypes are misidentified, extralimital (TL: California).

Spilomena occidentalis R. Bohart, 1955, paratypes, BMEC: new for Canada (TL: Arizona).

Taxonomy notes

The following notes discuss taxonomic changes such as new synonyms and reinstated species. Furthermore, we clarify species concepts where they differ from those of previous authors in order to avoid confusion with other species.

Astatidae

Diploplectron Fox: Unfortunately, Parker (1972) misdiagnosed some of the species, which led to confusion about the identity of the Canadian species. Couplet 10, lead 1 in Parker's key to females should read "Least interocular distance as long as *or shorter* than flagellomeres I and II". Lead 2 should read "Least interocular distance more [not less] than flagellomeres I and II".

Bembicidae

Microbembex monodonta (Say, 1824): Most specimens from the Prairie provinces are highly xanthic (e.g., Fig. 16) and agree perfectly with the description of *M. evansi* R. Bohart, 1993. This species is currently known only from the Monahans Sandhills in Texas (Bohart 1993), but it is likely much more widespread on the Great Plains. We are convinced that the xanthic Canadian forms are merely colour varieties of *M. monodonta*, and this can also be assumed for *M. evansi*. Similar geographic colour variation occurs in other Bembicini such as *Bicyrtes quadrifasciatus*.
Gorytes angustus (Provancher, 1895): The identity of this species was clarified by examination of images of the holotype since the species cannot be recognized

based on previously published diagnostic characters. It is distinguished from the very similar and largely sympatric *G. provancheri* (see below) by the simple (vs. widened) hypostomal carina. A more detailed diagnosis will be provided in an upcoming review of the genus.

Gorytes decorus Fox, 1896, **sp. restit.**: This species was synonymized with *G. atricornis* Packard, 1867 by Bohart in Bohart and Menke (1976). It is reinstated here because of significant differences in morphology and coloration: males of *G. decorus* have wider tyloids than *G. atricornis* and the tyloids are dull (vs. shining). The femora of both sexes of *decorus* have substantial ferruginous markings (absent in *atricornis*).

Gorytes provancheri Handlirsch, 1895 is a replacement name for *G. laticinctus* Provancher, 1888, a secondary junior homonym of *Euspongius laticinctus* Lepeletier, 1832. Unfortunately, the type material of Provancher's species is lost (Gahan and Rohwer 1917) and the species is unrecognizable based on the original description. Our concept of *G. provancheri* follows Bohart who described several western species in this genus (Bohart 1971). We compared Canadian material with specimens from California and Nevada identified by Bohart in the collection of the University of California at Davis (differential diagnosis see under *G. angustus*). The identity of the species will be fixed by neotype designation in an upcoming review of the genus.

Nysson freyigessneri Handlirsch, 1887, **sp. restit.**: This species was synonymized with *N. aurinotus* Say, 1837 by Bohart and Menke (1976). However, the two species do not only differ in coloration (i.e., *N. freyigessneri* usually has more or less extensive ferruginous ground colour of tergum 1) but also structurally. In *N. freyigessneri* males, flagellomere XI is more emarginate and F-X has fewer enlarged hairs (two vs. four or five in *N. aurinotus*).

Crabronidae

Crabro canningsi Finnamore, 1988, **syn. nov.** is synonymized with the Palearctic *C. maeklini* Morawitz, 1866. We consider the diagnostic differences mentioned by Finnamore (1988) insignificant. DNA barcodes of *C. canningsi* specimens from the Yukon and Nunavut differ by merely 0.32% from barcodes of *C. maeklini* from Finland (BOLD 2024c).

Crabro hispidus Fox, 1895. Bohart (1976) apparently misassociated dark females of *C. florissantensis* with *C. hispidus*. The diagnostic character (colour of hairs on frons) used in his key is either incorrect or unreliable and contradicts sex associations obtained through DNA barcoding (BOLD 2024c) as well as collections of females associated with males of *C. florissantensis* from Alberta, British Columbia and Washington at the PMAE and CNC. We have not seen the true female of *C. hispidus* and are therefore unable to distinguish it from *C. florissantensis*. Bohart's Canadian records of *C. hispidus* are based on females only and therefore disregarded.

Crossocerus barbipes (Dahlbom, 1845), which was originally described from Sweden, is assumed to have a Holarctic distribution. However, COI sequences on BOLD (2024c) show Nearctic "*barbipes*" as the sister clade to the western Nearctic species *C. stricklandi*

Pate. The clade containing both species is in turn sister group to the clade that represents Palearctic *C. barbipes*. This suggests that Nearctic “*barbipes*” is a distinct species. Synonymy of *C. stricklandi* with *C. barbipes* can be ruled out since males of both species are well differentiated morphologically (Leclercq 2000). Originally, the Nearctic species that is currently called “*barbipes*” was described as *C. wickhamii* (Ashmead, 1899) based on material from Alaska, but it was later synonymized by Krombein (1951). *Crossocerus wickhamii* is likely the correct name for Nearctic “*barbipes*”. We are not reinstating the species here because we have not examined the holotype, and it cannot be ruled out at this point that Palearctic *C. barbipes* ranges into Alaska.

Crossocerus eriogoni (Rohwer, 1908), **syn. nov.** The diagnostic characters that separate this species from *C. minimus* (Packard, 1867) (see Leclercq 2000) are very subtle, variable and show significant overlap when longer series of specimens are examined. *C. eriogoni* is best regarded as a southwestern morph of *C. minimus*. In Canada, it occurs only in the Prairie region of Alberta and Saskatchewan, whereas *C. minimus* is more northern in the west and also occurs in the east.

Lindenius errans (Fox, 1895), **sp. restit.**: Pate (1947) reduced *L. errans* to a subspecies of *L. columbianus* (Kohl, 1892) and Bohart and Menke (1976) synonymized it with the latter. *Lindenius errans* is re-instated as a good species because of significant morphological differences. The number of tyloids on the male antennae is reduced (restricted to flagellomeres I to IV, V, VI or VII vs. F-I to IX, X or XI in *L. columbianus*) and the pronotal angles are less prominent. *Lindenius errans* is eastern, *L. columbianus* western. As far as we know, the species are allopatric in Canada. However, their ranges are contiguous in southwestern Alberta and might narrowly overlap there.

Solierella inermis (Cresson, 1873) and *S. lucida* (Rohwer, 1909). The latter belongs in the *S. inermis*-group (Fig. 54) but was omitted from Bohart’s (1991) species key. *S. lucida* is currently treated as a valid species but might be a synonym of *S. inermis*. At present, this problem cannot be solved because the type of *S. inermis* is a female but identification in this species group relies mostly on male diagnostic characters. If *S. lucida* is indeed a good species, the name probably applies to Canadian populations. Based on the fact that, (1) *S. lucida* has never been recorded again after its original description, (2) *S. inermis* is supposedly widespread including on the Great Plains (Krombein 1979), and (3) the two names might be synonymous we tentatively apply the name *S. inermis* to populations from Alberta and Saskatchewan.

Solierella mammillata Buck, **nom. nov.** is a replacement name for *Niteliopsis foxii* Viereck, 1906. The latter is preoccupied by *Plenoculus foxii* Viereck, 1902. *N. foxii* was incorrectly synonymized with *S. fossor* (Rohwer, 1909) by Krombein (1951). *S. mammillata* differs from *S. fossor* by the short posteroapical spines of female fore tarsomeres 1–4 (the one on the basitarsus is at most half as long as tarsomere 2 vs. as long in *S. fossor*) and the very short, nipple-like, apicomedial process of the male fore coxa (much longer in *S. fossor*, about as long as fore tarsomere 3). These characters also serve to distinguish *S. mammillata* from an undescribed species of the *S. fossor*-group (= group I of Williams 1950) that occurs largely sympatrically in the Canadian Prairie provinces.

Belomicrus forbesii (Robertson, 1889) (Fig. 55). Pate (1940) synonymized *B. columbianus* (Kohl, 1892) with *B. forbesii*, which was later reversed by Bohart (1994b). The colour patterns that distinguish these nominal species are highly variable and intergrade in Canada. We follow Pate's view in considering them one and the same species.

Oxybelus pacificus (Rohwer, 1909), **sp. restit.**: This species was synonymized with *O. emarginatus* Say, 1837 by Krombein (1955). It is re-instated as a good species based on coloration and significant structural differences. The humeral plate of *O. pacificus* is largely blackish brown (vs. orange in *O. emarginatus*). The medial clypeal tooth of the male is well developed (vs. weak or absent), and lateral teeth of the female clypeus are more acute and slightly splayed forward and outward (vs. more obtuse and not splayed). The DNA barcodes of both species diverge significantly by 10.7–12.4% (BOLD 2024c). *Oxybelus pacificus* is western and *O. emarginatus* eastern; their ranges broadly overlap in the Canadian Prairie Provinces.

Trypoxylon clavicerum Lepeletier & Serville, 1828 and *T. kostylevi* Antropov, 1985. Some Canadian specimens key to *kostylevi* based on genitalic characters (e.g., see Jacobs 2007). Schmid-Egger et al. (2018) argued that they are in fact the same species because they cannot be distinguished through DNA barcoding, females are morphologically inseparable and male genitalic differences appear to be preparation artefacts. We follow this view and consider all Canadian material *T. clavicerum*.

Trypoxylon sculleni Sandhouse, 1940. We consider previously identified Canadian material of this taxon conspecific with *T. pennsylvanicum* de Saussure, 1867. Antropov (2003) provided detailed diagnoses of both species. We were unable to corroborate the genitalic differences reported there. Non-genitalic characters are variable and very subtle. *T. sculleni* material from east of the Rocky Mountains (Finnamore 1994; Buck 2004: fide Antropov in litt.) is indistinguishable from *T. pennsylvanicum*, but specimens from British Columbia and Pacific States tend to be larger than eastern populations of the latter. We strongly suspect that *T. sculleni* is a synonym of *T. pennsylvanicum* but we are unable to determine this with certainty since we have only seen a few specimens of *T. sculleni* from the Pacific U.S., which includes the type locality of this species (Corvallis, Oregon).

Pemphredonidae

Diodontus. Two-fifths (10 spp.) of the Canadian fauna remains undescribed, and only a few species are recognizable based on the previously published literature. Eighme's (1989) revision of the North American species is inadequate and has been a major stumbling block for the proper understanding of many species. Some of the diagnostic characters are uninformative, and the keys and diagnoses are riddled with errors and inaccuracies. The sexes of four species were associated incorrectly, four species were wrongly synonymized, eight obvious synonymies were missed, and the species groups are poorly defined, in one case placing overlooked synonyms of a single species in three different species groups. In order to clarify the identity of Canadian species we had to examine type material of 25 nominal

species (see above). The results of this review will be published separately (Buck, in prep.). The following notes briefly clarify the status of a number of species.

Diodontus americanus Packard, 1867. The following new or revised synonyms merely represent insignificant varieties of the same species: *D. florissantensis* Rohwer, 1909, **syn. rev.**, *D. bidentatus* Rohwer, 1911, **syn. nov.**, *Xylocelia siouxensis* Mickel, 1916, **syn. nov.** and *Xylocelia striata* Mickel, 1916, **syn. nov.** On the other hand, *D. gillettei* Fox, 1892, **syn. nov.** and *D. rugosus* Fox, 1892, **syn. nov.** appear to be misdiagnosed by Eighme (1989) based on comparison with type material. The species that Eighme called *D. gillettei* is in fact distinct (present in Alberta and Saskatchewan) but remains undescribed. Eighme's concept of *D. rugosus* is likely based on misidentified material and the sexes are associated incorrectly.

Diodontus flavitarsis-group. In Canada and Alaska, this species group includes *D. adamsi* Titus, 1909, *D. flavitarsis* Fox, 1892, *D. nigrinus* Fox, 1892, *D. virginianus* (Rohwer, 1917), and one undescribed species. Males of this group are very similar and hard to distinguish. Unfortunately, the types of several nominal species (including *D. flavitarsis* and *D. virginianus*) are males, which has caused much confusion.

Diodontus flavitarsis Fox, 1892. The male of this species is extremely similar to *D. virginianus*. Eighme (1989) separated them based on the colour of the pronotal lobe, but this character is variable and has no diagnostic value (Buck 2004). The species are redefined here based on slight differences in the flagellar placoids (better developed in *D. virginianus*) and distribution (*D. virginianus* is eastern, *D. flavitarsis* western). Females are easier to distinguish (upper frons more densely punctate in *D. virginianus*) but were not separated by Eighme. The females that Eighme (and subsequently Buck 2004) called *D. flavitarsis* actually belong to an undescribed species and all four species that were synonymized by him with *D. flavitarsis* are in fact different species.

Diodontus nigrinus Fox, 1892, **sp. restit.** This species (and its synonyms *Xylocelia maesta* Mickel, 1916 and *X. atra* Mickel, 1916) were incorrectly synonymized with *D. flavitarsis* by Eighme (1989). Eighme used the name *D. vallicolae* Rohwer, 1909, **syn. nov.** for the male and misassociated it with a female in a different species group. Both males and females of *D. nigrinus* are uniquely diagnosed by the presence of a small fovea in the tegular cavity of the scutum (see Eighme 1989). This fovea is sometimes weakly developed (especially in females and specimens from Ontario and British Columbia), which led to the misidentification of Ontario specimens as *D. flavitarsis* in Buck (2004).

Diodontus fraternus Rohwer, 1909. Eighme (1989) misdiagnosed and likely misidentified the male of this species, incorrectly associating the sexes. Contrary to Eighme's description, the male flagellum possesses placoids and is only slightly swollen. A species with conspicuously swollen male flagellum from Alberta remains undescribed.

Diodontus leguminiferus Cockerell, 1897. Eighme (1989) misdiagnosed and probably misidentified the male of this species. Contrary to his key and description, male tergum 6 does not possess stout, spine-like setae. The female was not known to Eighme but can be recognized by its unusually slender flagellum, a unique character that is shared with the male.

Diodontus metathoracicus (Mickel, 1916). This species is part of a difficult species complex including the extralimital *D. antennatus* (Mickel, 1916) (incorrectly synonymized with the former by Eighme 1989) plus one or two undescribed species in western Canada and several more in the United States.

Diodontus neomexicanus Rohwer, 1909. Eighme (1989) misdiagnosed and possibly misidentified the male of this species (male flagellum with placoids on flagellomeres (V)VI or VII to XI, not on “8–12” as stated by Eighme). The male is similar to an undescribed species that is widespread in western Canada.

Pemphredon bipartior Fox, 1892, **sp. restit.** and *P. mortifer* Valkeila, 1972: Both *P. bipartior*, a Nearctic species, and *P. mortifer*, a Palearctic species, were synonymized with the Palearctic *P. rugifer* (Dahlbom, 1844) by Dollfuss (1995). Other Palearctic workers did not follow Dollfuss and continued to consider *P. mortifer* a good species. *P. bipartior* is reinstated here as a good species based on multiple diagnostic characters such as the fringe of long hairs on the female fore basitarsus (absent in *P. rugifer*), dentition of female mandible, and largely smooth metanotum in both sexes. *P. mortifer* has never been recorded from the Nearctic before and is likely introduced. Christian Schmid-Egger kindly confirmed the identity of Canadian specimens. Canadian material identified as *rugifer* by Dollfuss includes both *P. bipartior* and *P. mortifer*.

Pemphredon lugubris (Fabricius, 1793) and *P. montana* Dahlbom, 1845. These species are currently considered to have a Holarctic distribution, but DNA barcoding data reveals deep genetic divergences between Nearctic and Palearctic lineages (BOLD 2024c). Nearctic populations of both species have available names that were only synonymized relatively recently by Dollfuss (1995): *P. concolor* Say, 1824 (TL: “Northwest Territory”), currently a synonym of *P. lugubris*, and *P. angularis* Fox, 1892 (TL: New Hampshire), currently a synonym of *P. montana*. We have not examined Palearctic material, and we therefore refrain from making any taxonomic changes. As in the case of *P. bipartior* and *P. mortifer* (see above), we strongly suspect that *P. concolor* and *P. angularis* represent good species that will have to be reinstated.

Stigmus americanus Packard, 1867 and *S. fraternus* Say, 1824. These species appear to be opposites in a seemingly continuous range of variation and cannot be delimited from each other in a satisfactory way (see also Krombein 1973). DNA barcoding data reveal several genetic clades, some of which diverge significantly (BOLD 2024c). Based on molecular data, at least three cryptic species can be expected in Canada.

Philanthidae

Cerceris occipitomaculata Packard, 1866. Scullen (1965) misdiagnosed the male of this species, which led to the erroneous Ontario record by Buck (2004), based on an atypical specimen. The male of *C. occipitomaculata* closely resembles *C. nigrescens* but can be distinguished by the lighter underside of the flagellum and denser clypeal brushes.

Cerceris prominens Banks, 1912. This species has not been properly diagnosed in the literature, which has led to much confusion about its identity. Ontario records by Buck

(2004) are incorrect, but the specimens could not be located for re-examination. The diagnosis in Buck et al. (2006), which was based on those specimens is incorrect. The female of *C. prominens* differs from *C. clypeata* by the more erect and slightly narrower clypeal process (similar to Fig. 168b in Scullen 1965, as "*C. nebrascensis*", apparently in error). The male clypeus is slightly swollen just above the apical margin but otherwise more or less flat, unlike related species.

Philanthus zebratus Cresson, 1880. Ferguson (1984a) reinstated *P. basilaris* Cresson, 1880 from synonymy with *P. zebratus*, referring populations from AB and SK to the former. The two species are poorly defined and intergrade in Canada. We follow Bohart and Grissell (1975) in considering them mere geographic variants. The synonymy of *P. basilaris* is confirmed.

Psenidae

Mimesa curta Pulawski & Buck, **nom. nov.** is a replacement name for *Psen simplex* Malloch, 1933. The latter is preoccupied by *Psen simplex* Tournier, 1889, a synonym of *Psenulus schencki* (Tournier, 1889). The homonymy was first discovered by Pulawski (2025) which is reflected by the authorship of the replacement name.

Mimesa gregaria (Fox, 1898), **syn. nov.** is synonymized with *M. uncinata* Cresson, 1865. These two nominal species broadly intergrade in western Canada and are structurally inseparable. *M. uncinata* is darker than *M. gregaria* and occurs at higher altitudes and latitudes than the latter.

Sphecidae

Prionyx canadensis (Provancher, 1887). Type examination confirms the present interpretation of the species (see Bohart and Menke 1963). However, the type locality ("Ottawa") was probably given in error since the lectotype bears no locality label and no verifiable Ontario records of this species exist (see also Buck 2004: Table 1). Females of *P. canadensis* are very difficult to separate from *P. parkeri* (Fig. 85), which is known to occur in Ontario. Unfortunately, the two Ontario records of *P. canadensis* in Bohart and Menke (1963: Fig. 35) were given without specific mention of locality or depository. We therefore consider these records doubtful and exclude *P. canadensis* from the Ontario species list.